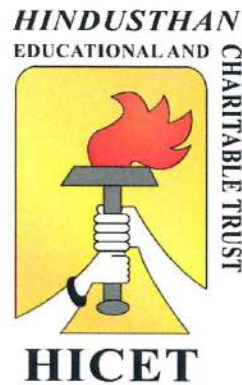


HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi & Accredited by NAAC with 'A' Grade)
Coimbatore – 641 032

B.E. MECHANICAL ENGINEERING



Curriculum & Syllabus

2017-2018

CHOICE BASED CREDIT SYSTEM

VISION OF THE INSTITUTE

To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values.

MISSION OF THE INSTITUTE

- To provide academic excellence in technical education through novel teaching methods.
- To empower students with creative skills and leadership qualities.
- To produce dedicated professionals with social responsibility.

VISION OF THE DEPARTMENT

To provide quality technical education in Mechanical Engineering and build holistic professionals who can excel in the engineering establishments and serve for the country with ethical values.

MISSION OF THE DEPARTMENT

- M1: To prepare graduates with good technical skills and knowledge.
- M2: To prepare graduates with life-long learning skills to meet the requirements in the higher education and in society.
- M3: To prepare graduates as successful entrepreneur with employment skills, ethics and human values.


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HiCET**

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1: Exhibit their sound theoretical, practical skills and knowledge for Successful employments, higher studies, research and entrepreneurial assignments.

PEO 2: Lifelong learning skills, professional ethics and good communication Capabilities along with entrepreneur skills and leadership, so that they can succeed in their life.

PEO 3: Become leaders and innovators by devising engineering solutions for social issues and problems, thus caring for the society.


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PROGRAMME OUTCOMES

Engineering Graduates will be able to:

PO 1. Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis:

Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society:


Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.


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PO8. Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance:

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning:

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES

PSO 1: To design, analyze and apply knowledge in complex engineering problems with time effective software solutions.

PSO 2: To understand the relevance of engineering practices with society and environment and become an ethical team oriented effectively communicating individual with managerial skills and sustained learning ability.


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CURRICULUM



Hindusthan College of Engineering and Technology

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Coimbatore, Tamil Nadu.



DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDER GRADUATE PROGRAMMES

DEPARTMENT OF MECHANICAL ENGINEERING (UG)

REGULATION 2016

For the students admitted during the academic year 2017-2018 and onwards

SEMESTER I

S.No	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	16MA1101	Engineering Mathematics-I	BS	3	1	0	4	25	75	100
2	16PH1101	Engineering Physics	BS	3	0	0	3	25	75	100
3	16CY1101	Engineering Chemistry	BS	3	0	0	3	25	75	100
4	16HE1101R	Essential English for Engineers -I	HS	3	1	0	4	25	75	100
5	16GE1101	Computer Programming	ES	3	0	0	3	25	75	100
6	16GE1102	Engineering Graphics	ES	3	1	0	4	25	75	100
PRACTICAL										
7	16PS1001	Physical Sciences Lab – I	BS	0	0	2	1	50	50	100
8	16GE1001	Computer Programming Lab	ES	0	0	4	2	50	50	100
9	16GE1002	Engineering Practices Laboratory	ES	0	0	4	2	50	50	100
10	16GE1003	Value Added Course – I Language Competency Enhancement Course I	HS	0	0	2	1	100	0	100
Total:				18	3	12	27	400	600	1000

SEMESTER II

S.No	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	16MA2102	Engineering Mathematics-II	BS	3	1	0	4	25	75	100
2	16PH2102	Physics of Materials	BS	3	0	0	3	25	75	100
3	16CY2102	Environmental Sciences	BS	3	0	0	3	25	75	100
4	16HE2102R	Essential English for Engineers -II	HS	3	1	0	4	25	75	100
5	16GE2101	Engineering Mechanics	ES	3	1	0	4	25	75	100

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6	16EE2202	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
PRACTICAL										
7	16PS2001	Physical Sciences Lab - II	BS	0	0	2	1	50	50	100
8	16ME2001	Computer Aided Drafting Lab	ES	0	0	4	2	50	50	100
9	16GE2001	Value Added Course – II Language Competency Enhancement Course II	HS	0	0	2	1	100	0	100
Total:				18	3	8	25	350	550	900

For the students admitted during the academic year 2016-2017 and onwards

SEMESTER III

S.No	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	16MA3103	Fourier Analysis and Statistics	BS	3	1	0	4	25	75	100
2	16ME3201	Manufacturing Technology – I	PC	3	0	0	3	25	75	100
3	16ME3202	Engineering Thermodynamics	PC	3	1	0	4	25	75	100
4	16ME3203	Fluid Mechanics and Machinery	PC	3	1	0	4	25	75	100
5	16ME3204	Strength of Materials	PC	3	0	0	3	25	75	100
6	16EE3231	Electrical Drives and Controls	PC	3	0	0	3	25	75	100
PRACTICAL										
7	16ME3001	Manufacturing Technology Lab – I	PC	0	0	4	2	50	50	100
8	16ME3002	Solid and Fluid Mechanics Lab	PC	0	0	4	2	50	50	100
9	16EE3031	Electrical Engineering Lab	PC	0	0	4	2	50	50	100
Total:				18	3	12	27	300	600	900

SEMESTER IV

S.No	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	16MA4107	Numerical Methods	BS	3	1	0	4	25	75	100
2	16ME4201	Manufacturing Technology – II	PC	3	0	0	3	25	75	100
3	16ME4202	Thermal Engineering	PC	3	0	0	3	25	75	100
4	16ME4203	Kinematics of Machinery	PC	3	1	0	4	25	75	100
5	16ME4204	Engineering Materials and Metallurgy	PC	3	0	0	3	25	75	100
6	16ME4205	Machine Drawing	PC	1	4	0	3	25	75	100
PRACTICAL										
7	16ME4001	Manufacturing Technology Lab–II	PC	0	0	4	2	50	50	100
8	16ME4002	Thermal Engineering Lab-I	PC	0	0	4	2	50	50	100

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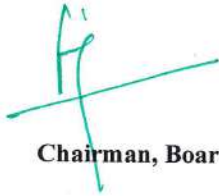
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9	16ME4701	Communication Skills Lab	HS	0	0	2	1	50	50	100
Total:				16	6	10	25	300	600	900


CREDIT DISTRIBUTION

R-2016

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	27	25	27	25	24	24	23	12	187



Chairman, Board of Studies



Dean - Academics



Principal

**Chairman - BoS
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PRINCIPAL
Hindusthan College of Engineering & Technology
COIMBATORE - 641 032

SYLLABUS

SEMESTER-I

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16MA1101	ENGINEERING MATHEMATICS – I (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective	Description
	1. Develop the skill to use matrix algebra techniques that is needed by engineers for practical applications. 2. Find curvature, evolutes and envelopes using the concept of differentiation. 3. Solve ordinary differential equations of certain types using Wronskian technique. 4. Familiarize the functions of several variables which are needed in many branches of engineering. 5. Understand the concept of double and triple integrals.

Unit	Description	Instructional Hours
I	MATRICES Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (without proof) – Cayley - Hamilton Theorem (excluding proof) – Orthogonal matrices – Diagonalization of matrices by orthogonal transformation–Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	DIFFERENTIAL CALCULUS Curvature in cartesian co-ordinates – Radius and Centre of curvature - Circle of curvature – Involute and Evolutes(parabola, ellipse, cycloid, asteroid) – Envelopes - single parameter and two parameter family of curves.	12
III	ORDINARY DIFFERENTIAL EQUATIONS Second and higher order linear differential equations with constant coefficients and with RHS of the form e^{ax} , x^n , $\sin x$ or $\cos x$, $e^{ax}f(x)$ and $xf(x)$ where $f(x)$ is $\sin bx$ or $\cos bx$ – Method of variation of parameters – Linear differential equations with variable coefficients (Euler's equation)	12
IV	FUNCTIONS OF SEVERAL VARIABLES Total differentiation (excluding implicit functions) - Partial derivatives of composite functions - Taylor's series for functions of two variables- Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers – Jacobians.	12
V	MULTIPLE INTEGRALS Double integrals in Cartesian coordinates – Change of order of integration – Area enclosed by the plane curves (excluding surface area) – Triple integrals in Cartesian co-ordinates – Volume of solids using Cartesian co-ordinates.	12
Total Instructional Hours		60

Course Outcome	Description
	CO1: Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes CO2: Apply the concept of differentiation to find the radius, centre and circle of curvature of any curve CO3: Develop sound knowledge of techniques in solving ordinary differential equations that model engineering problems CO4: Identify the maximum and minimum values of surfaces. CO5: Computation of area of a region in simpler way by changing the order of integration and evaluation of triple integrals to compute volume of three dimensional solid structures

TEXT BOOKS:

T1- Ravish R Singh, Mukul Bhatt, "Engineering Mathematics", McGraw Hill education (India) Private Ltd., Chennai, 2017.

T2- Veerarajan T, "Engineering Mathematics-I", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016

REFERENCE BOOKS :

R1-Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.

R2- Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.

R3- Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning, 2012.

R4-Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" Vol I, Second Edition, Pearson publishing, 2011.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16PH1101	ENGINEERING PHYSICS (Common to all Branches)	3	0	0	3

- Course Objective
1. Illustrate the fundamental knowledge in mechanical properties of matter and thermal physics.
 2. Gain knowledge about laser and their applications.
 3. Conversant with principles of optical fiber, types and applications of optical fiber.
 4. Discuss the architectural acoustics and applications of Ultrasonics.
 5. Extend dual nature of matter and the Necessity of quantum mechanics to explore the behavior of sub atomic particles.

Unit	Description	Instructional Hours
	PROPERTIES OF MATTER AND THERMAL PHYSICS	
I	Elasticity – Hooke’s law – Stress-strain diagram - Relation between three moduli of elasticity (qualitative) — Poisson’s ratio – Bending moment – Depression of a cantilever – Derivation of Young’s modulus of the material of the beam by Uniform bending – I-shaped girder. Modes of heat transfer – Thermal conductivity – Newton’s law of cooling - Lee’s disc method - Conduction through compound media (series and parallel).	9
	LASER AND APPLICATIONS	
II	Spontaneous emission and stimulated emission – Population inversion – Pumping methods – Derivation of Einstein’s coefficients (A&B) – Types of lasers – Nd:YAG laser, CO2 laser, Semiconductor lasers:(homojunction and heterojunction) – Laser Applications – Industrial applications: laser welding, laser cutting, laser drilling – Holography – Construction and reconstruction of images.	9
	FIBER OPTICS AND APPLICATIONS	
III	Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index, modes and materials) – Crucible-crucible technique for fiber fabrication – Sources (LED and LASER) and detectors (p-i-n photodiode and avalanche photodiode) for fiber optics - Fiber optical communication link –Fiber optic sensors – Temperature and displacement sensors.	9
	ACOUSTICS AND ULTRASONICS	
IV	Classification of sound – Weber–Fechner law – Sabine’s formula (no derivation) - Absorption coefficient and its determination –Factors affecting acoustics of buildings and their remedies. Production – Magnetostrictive generator – Piezoelectric generator – Determination of velocity using acoustic grating – Non destructive testing – Ultrasonic pulse echo system.	9
	QUANTUM PHYSICS AND APPLICATIONS	
V	Black body radiation – Planck’s theory (derivation) –Compton effect experimental verification only - Matter waves – Physical significance of wave function – Schroedinger’s wave equations – Time independent and time dependent wave equations –Particle in a box (One dimensional) – Scanning electron microscope – Transmission electron microscope.	9
Total Instructional Hours		45

- Course Outcome
- CO1: Enhance the fundamental knowledge in Properties of Matter and Thermal Physics.
CO2: Understand the advanced technology of LASER in the field of Engineering and medicine.
CO3: Exposed the fundamental knowledge of Optical fiber in the field of communication Engineering.
CO4: Understand the production of ultrasonics and its applications in NDT.
CO5: Impart the fundamental knowledge on Quantum Physics.

TEXT BOOKS:

- T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011.
T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, DhanpatRai Publications (P) Ltd., New Delhi, 2013.

REFERENCE BOOKS:

- R1 - Arthur Beiser “Concepts of Modern Physics” Tata McGraw Hill, New Delhi – 2010
R2 - M.N Avadhanulu and PG Kshirsagar “A Text Book of Engineering physics” S. Chand and Company Ltd., New Delhi, 2014
R3 - Dr. G. Senthilkumar “Engineering Physics – I” VRB publishers Pvt Ltd., 2013

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16CY1101	ENGINEERING CHEMISTRY (Common to all Branches)	3	0	0	3

- Course Objective**
1. The student should be conversant with boiler feed water requirements, related problems and water treatment techniques.
 2. The student should be conversant with the principles of polymer chemistry and engineering applications of polymers and composites
 3. The student should be conversant with the principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
 4. To acquaint the student with important concepts of spectroscopy and its applications.
 5. To acquaint the students with the basics of nano materials, their properties and applications

Unit	Description	Instructional Hours
I	WATER TECHNOLOGY Hard water and soft water- Disadvantages of hard water- Hardness: types of hardness, calculations, estimation of hardness of water – EDTA method - scales and sludges – boiler corrosion – priming and foaming – caustic embrittlement; Conditioning methods of hard water – External conditioning - demineralization process- Internal conditioning - domestic water treatment: screening, sedimentation, coagulation, filtration, disinfection – chlorine – UV method; desalination: definition, reverse osmosis.	9
II	POLYMER & COMPOSITES Polymerization – types of polymerization – addition and condensation polymerization – mechanism of free radical addition polymerization – copolymers – plastics: classification – thermoplastics and thermosetting plastics, preparation, properties and uses of commercial plastics – PVC, Teflon – moulding of plastics (extrusion and compression); rubber: vulcanization of rubber, synthetic rubber – butyl rubber, SBR; composites: definition, types of composites – polymer matrix composites – FRP.	9
III	ENERGY SOURCES AND STORAGE DEVICES Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells: Types of batteries- alkaline battery lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H ₂ -O ₂ fuel cell applications.	9
IV	ANALYTICAL TECHNIQUES Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – interferences - estimation of nickel by atomic absorption spectroscopy.	9
V	NANOMATERIALS Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: definition, carbon nanotubes (CNT), types of carbon nano tubes – single walled and multi walled carbon nanotubes – synthesis of carbon nanotubes: chemical vapour deposition – laser ablation – arc-discharge method; properties of CNT: mechanical, electrical, thermal and optical properties; applications of carbon nanotubes in chemical field, medicinal field, mechanical field and current applications.	9

Total Instructional Hours 45

- Course Outcome**
- CO1: Illustration of the basic parameters of water, different water softening processes and effect of hard water in industries.
- CO2: Knowledge on basic properties and application of various polymers and composites as an engineering material.
- CO3: Summarize the various energy sources and energy storage devices
- CO4: Analyze various analytical skills in handling various machines, instruments, apart from understanding the mechanism involved.
- CO5: Describe the basic properties and application of nanomaterials.

TEXT BOOKS

- T1 - P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2015).
T2 - O.G.Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCES

- R1 - B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
R2 - B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2005).

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16HE1101R	ESSENTIAL ENGLISH FOR ENGINEERS - I (Common to all Branches)	3	1	0	4

- Course Objective**
1. It fulfills the necessary skills needed in today's global workplaces.
 2. Student will be able to interpret and illustrate formal communication.
 3. It empowers students in choosing right lexical techniques for effective presentation
 4. It equips the learner to analyze and list out things in logical order
 5. The learner develops the ability to create and integrate ideas in a professional way.

Unit	Description	Instructional Hours
I	Getting to know people – Introduction – Talking about jobs (Present Simple) – Talking about working conditions(Adverb of Frequency) - Talking about company history and structure (Past simple, Prepositions of Time) – Talking about company activities (Connectors of addition and contrast, Present Continuous) – Focus on language – Parts of Speech – Gerund and Infinitives – Instruction- General Vocabulary.	12
II	Vocabulary practice – (Telephoning Leaving and taking messages) – requests and obligation – Describing trends (Adjectives and Adverbs) – Talking about company performance (present perfect and past simple, Reasons and consequences) – Reading Test Practice Describing products Dimensions, (Comparatives and Superlatives, Question formation) – Talking about product development (Sequencing words, Present continuous and going to) – Articles – Prepositions- Synonyms – Antonyms- Recommendations- Interpretation of a chart.	12
III	Talking about business equipment (Giving Instruction) – Letter Phrases- Writing Test Practice-Talking about facilities (Asking for and giving direction)- Presentation on a general topic -Talking about traffic and transport(making predictions)- Discussion on current affairs - Tenses- Present – Past-Future-Forms of verbs- Word techniques- Formation-Prefixes-Suffixes.	12
IV	Talking about conference arrangement (checking and confirming) – Talking about a conference before, after, when, until etc. – Listening Test Practice- talking about production process – passive- Talking about quality control Conditional I (real) (Making suggestions) – Itinery- Jumbled sentences- Paragraph writing- Essay writing – Checklist- Letter to Inviting Dignitaries – Accepting invitation- Declining Invitation.	12
V	Talking about call centers, insurance and changes in working practices (future possibility/probability)- Talking about banking- Speaking Test practice – Talking about delivery services (preposition of Time)- Talking about trading (Tense review)- Talking about recruitment conditional 2 (hypothetical) – talking about job applications (indirect questions) – Reading, Writing and Listening Test – Job application Letter and Resume Writing- Permission letters.	12
Total Instructional Hours		60
Course Outcome	CO1 - Recognize different parts of speech for better usage. CO2 - Interpret and illustrate formal communication CO3 - Choosing right lexical techniques for effective presentation. CO4 - Analyze and list out things in logical order. CO5 - Create and integrate ideas in a professional way.	

TEXT BOOKS:

- T1 - NormanWhitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate – 2nd Edition. 2014.
T2 - Ian Wood and Anne Willams. “Pass Cambridge BEC Preliminary”, Cengage Learning press 2013.

REFERENCE BOOKS:

- R1 - Meenakshi Raman and Sangeetha Sharma. “Technical Communication-Principles and Practice”, Oxford University Press, 2009.
R2 - Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi, 2005
R3 - KamalleshSadanan “A Foundation Course for the Speakers of Tamil-Part-I & II”, Orient Blackswan, 2010.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1101	COMPUTER PROGRAMMING (COMMON TO ALL BRANCHES)	3	0	0	3

- Course Objective**
1. Learn the fundamentals of computers.
 2. Learn the basics of C programming
 3. Learn the basics of Arrays and String
 4. Learn the uses of functions and pointers.
 5. Learn the basics of structures and unions.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	BASICS OF COMPUTER Generation and Classification of Computers- Basic Organization of a Computer –Input and Output Devices– Hardware and Software definitions- Categories of Software- Number System Conversion and problems. Need for logical analysis and thinking – Algorithm -Pseudo code – Flow Chart.	9
II	BASICS OF 'C' PROGRAMMING Fundamentals of 'C' programming – Structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types –Expressions using operators in 'C' – Managing Input and Output operations-Decision making-Branching and Looping-Case study	9
III	ARRAYS AND STRINGS Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String Library functions – String Arrays. Matrix operations-Addition-Subtraction-Multiplication-Transpose-Case study.	9
IV	FUNCTIONS AND POINTERS Function – definition – Declaration – Types of Function definition – call by value-call by reference- Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays-Case study.	9
V	STRUCTURES AND UNIONS Structure- data type – definition – declaration –Nesting of structure - Union – Storage classes, Pre-processor directives-Case study.	9
TOTAL INSTRUCTIONAL HOURS		45

- Course Outcome**
- CO1: Use computers at user level, including operating systems, programming environments and differentiate between basic concepts of computer hardware and software.
- CO2: Analyze problems, design and implementing algorithmic solutions.
- CO3: Use data representation for the fundamental data types, read, understand and trace the execution of programs written in C language.
- CO4: Write the C code using a modular approach and recursive concepts.
- CO5: Explain the use of pointers, Structures and union.

TEXT BOOKS:

- T1 – Balagurusamy “Programming in ANSI C”, Seventh Edition, McGraw-Hill, 2016.
T2 - Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

REFERENCE BOOKS:

- R1 - Yashavant P. Kanetkar. “ Let Us C”, BPB Publications, 2011.
R2- M.Rajaram and P.Uma maheswari, “Computer Programming with C” Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2014.
R3 - Dr.N.Sengottaiyan and K.Ramya, “Fundamentals of Computer Programming”, Cengage Learning (India) Pvt. Ltd., 2016.


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16GE1102	ENGINEERING GRAPHICS (Common to all Branches)	3	1	0	4

Course Objective 1. To provide drafting skills for communicating the Engineering concepts and ideas.
2. To expose to BIS and International standards related to engineering drawings.

Unit	Description	Total Hours
I	PLANE CURVES Importance of engineering drawing, drafting instruments, drawing sheets – layout and folding. Lettering and dimensioning, BIS standards and scales. Geometrical constructions, Construction of ellipse, parabola and Hyperbola by eccentricity method, construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	15
II	PROJECTIONS OF POINTS, LINES AND PLANE SURFACES Introduction to Orthographic projections- Projection of points. Projection of straight lines inclined to both the planes, Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	15
III	PROJECTIONS OF SOLIDS Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is perpendicular and inclined to one plane and objects inclined to both the planes by rotating object method.	15
IV	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of truncated solids. Intersection of solids-cylinder vs cylinder.	15
V	ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS Isometric views and projections of simple and truncated solids such as - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions. Free hand sketching of multiple views from a pictorial drawing. Perspective projection of solids in simple position using visual ray method.	15
Total Instructional Hours		75

Course Outcome CO1: Draw the orthographic and isometric views of regular solid objects including sectional views.
CO2: Recognize the International Standards in Engineering Drawing practices.

TEXT BOOKS:

T1 - K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5th Edition New Age International Publishers, New delhi 2016.
T2 - K.V.Natarajan, "A textbook of Engineering Graphics", Dhanalaksmi Publishers, Chennai.

REFERENCE BOOKS:

R1 - BasantAgrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi 2008.
R2 - K. R. Gopalakrishnan, "Engineering Drawing" (Vol. I & II), Subhas Publications, Bangalore, 1998.
R3 - M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson Education, India, 2005.
R4 - N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University press, India 2015.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16PS1001	PHYSICAL SCIENCES LAB - I CHEMISTRY LAB - I (COMMON TO ALL BRANCHES)	0	0	2	1

Course Objective

1. Acquire practical skills in the determination of water quality parameters.
2. Acquaint the students with the determination of molecular weight of a polymer by viscometry.
3. Acquaint the students with the estimation of chemical substances using instrumental analysis techniques.

Expt. No.	Description of the Experiments	Total Practical Hours
1.	Preparation of molar and normal solutions and their standardization.	30
2.	Estimation of total, permanent and temporary hardness of Water by EDTA	
3.	Determination of chloride content of water sample by argentometric method.	
4.	Determination of available chlorine in bleaching powder.	
5.	Conductometric titration of strong acid vs strong base (HClvsNaOH).	
6.	Conductometric titration (Mixture of weak and strong acids)	
7.	Conductometric precipitation titration using BaCl ₂ and Na ₂ SO ₄	
8.	Determination of molecular weight and degree of polymerization using viscometry.	
9.	Estimation of iron content of the water sample using spectrophotometer. (1, 10 phenanthroline / thiocyanate method).	

Course Outcome

CO1: Estimate the different types of hardness in a water sample.
CO2: Determine the chloride content of water sample.
CO3: Calculate the strength of acid using conductometric titrations.
CO4: Calculate the strength of strong and weak acid using conductometric titrations.
CO5: estimate the amount of salt using conductometric precipitation titrations.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1001	COMPUTER PROGRAMMING LAB (COMMON TO ALL BRANCHES)	0	0	4	2

- Course Objective**
1. Be familiar with Microsoft office software.
 2. Be exposed to role of constants, variables, identifiers, operators and other building blocks of C Language.
 3. Be familiar with the use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
 4. Be familiar with the concept of Array and pointers dealing with memory management.
 5. Be exposed to Structures and unions.

S.NO	DESCRIPTION PF THE EXPERIMENTS	TOTAL PRACTICAL HOURS
	a. Word Processing:	
1.	1. Document creation, Text manipulation with Scientific notations 2. Table creation, Table formatting and conversion 3. Mail merge and Letter preparation 4. Flow Chart	3
	b. Spread Sheet:	
2.	1. Chart - Line, XY, Bar and Pie. 2. Formula - formula editor. 3. Spread sheet - inclusion of object, picture and graphics, protecting the document and sheet. 4. Sorting and Import / Export features.	6
	c. Basic C programming:	
3.	C program using I/O Statements	3
4.	C program using arithmetic operations	3
	Decision making statement & Looping Concepts	
5.	<ul style="list-style-type: none"> • Designing a simple arithmetic calculator. (Use switch statement) • Performing the following operations: (Use loop statement) • Generate Pascal's triangle. • Construct a Pyramid of numbers. 	6
	d. Arrays and Strings	
6.	C program using one dimensional arrays	3
7.	C program using two dimensional arrays	3
8.	C program using string functions	3
	e. Functions and pointers	
9.	Perform the following operations: (Use recursive functions) <ol style="list-style-type: none"> i. Find the factorial of a given integer. ii. Find the GCD (Greatest Common Divisor) of two given integers. iii. Solve Towers of Hanoi problem. 	6
10.	Program to swap two numbers using pointers - call by reference.	3
	f. Structures and Unions	
11.	C Program using Structures	3
12.	C Program using Unions	3
TOTAL INSTRCTIONAL HOURS		45

- Course Outcome**
- CO1: Use office packages for documentation and presentation.
CO2: Implement program using control structures.
CO3: Handle arrays and strings.
CO4: Handle functions and pointers.
CO5: Form heterogeneous data using structure and union.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16GE1002	ENGINEERING PRACTICES LABORATORY (Common to all Branches)	0	0	4	2

Course Objective To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

Expt. No.	Description of the Experiments
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I CIVIL ENGINEERING PRACTICE

Study of plumbing and carpentry components of Residential and Industrial buildings.

(A) PLUMBING WORKS:

- 1 Study on pipe joints, its location and functions: Valves, taps, couplings, unions, reducers, elbows in household fittings.
- 2 Study of pipe connection requirements for pumps.
- 3 Preparation of plumbing line sketches for water supply and sewage works.
- Hands-on-exercise:
 - 4 ➤ Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
 - 5 Demonstration of plumbing requirements of high-rise buildings.

(B) CARPENTRY USING POWER TOOLS ONLY:

- 1 Study of the joints in roofs, doors, windows and furniture.
- 2 Hands-on-exercise in wood works by sawing, planing and cutting.

MECHANICAL ENGINEERING

(A) Welding:

- 1 Preparation of arc welding of Butt joints, Lap joints and Tee joints

(B) Machining:

- 1 Practice on Simple step turning and taper turning
- 2 Practice on Drilling Practice

(C) Sheet Metal Work:

- 1 Practice on Models– Trays, cone and cylinder.

DEMONSTRATION

(D) Smithy

- Smithy operations : Upsetting, swaging, setting down and bending.
- Demonstration of Production of hexagonal headed bolt.

(E) Gas welding

(F) Foundry Tools and Operations.

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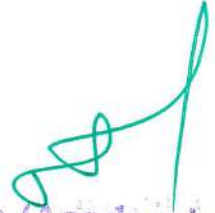
GROUP B (ELECTRICAL & ELECTRONICS)

S.No	Description of the Experiments
ELECTRICAL ENGINEERING PRACTICES	
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2	Fluorescent lamp wiring
3	Stair case wiring.
4	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5	Measurement of energy using single phase energy meter.
ELECTRONICS ENGINEERING PRACTICES	
1	Study of Electronic components and equipments – Resistors - colour coding
2	Measurement of DC signal - AC signal parameters (peak-peak, RMS period, frequency) using CRO.
3	Study of logic gates AND, OR, NOT and NAND .
4	Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5	Measurement of average and RMS value of Half wave and Full Wave rectifiers.
Total Practical Hours	
45	

Course Outcome
CO1: Fabricate wooden components and pipe connections including plumbing works.
CO2: Fabricate simple weld joints.
CO3: Fabricate electrical and electronics circuits.


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16GE1003	LANGUAGE COMPETENCY ENHANCEMENT COURSE- I (COMMON TO ALL BRANCHES)	0	0	2	1
Course Objective	✓	To enhance student language competency				
	✓	To train the students in LSRW skills				
	✓	To develop student communication skills				
	✓	To empower the trainee in business writing skills.				
	✓	To train the students to react to different professional situations				

Unit	Description	Instructional Hours
I	Listening Listening to technical group discussions and participating in GDs. listening to TED talks. Listen to Interviews & mock interview. Listening short texts and memos.	3
II	Reading Reading articles from newspaper, magazine. Reading comprehension. Reading about technical inventions, research and development. Reading short texts and memos.	3
III	Writing E-mail writing: Create and send email writing (to enquire about some details, to convey important message to all, to place an order, to share your joy and sad moment). Reply for an email writing.	3
IV	Speaking To present a seminar in a specific topic (what is important while choosing or deciding something to do). To respond or answer for general questions (answer for your personal details, about your family, education, your hobbies, your aim etc.,).	3
V	Speaking Participate in discussion or interactions (agree or disagree express your statement with a valid reason, involve in discussion to express your perspective on a particular topics).	3
Total Instructional Hours		15

Course Outcome

CO1- Trained to maintain coherence and communicate effectively.
CO2- Practiced to create and interpret descriptive communication.
CO3- Introduced to gain information of the professional world.
CO4- acquired various types of communication and etiquette.
CO5- Taught to improve interpersonal and intrapersonal skills.

TEXT BOOKS:

T1- Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press, 2016.
T2- Raymond Murphy, "Essential English Grammar", Cambridge University Press, 2019.

REFERENCE BOOKS :

R1- Meenakshi Raman and Sangeetha Sharma. "Technical Communication- Principles and Practice", Oxford University Press, 2009.

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SEMESTER-II

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16MA2102	ENGINEERING MATHEMATICS – II (COMMON TO ALL BRANCHES)	3	1	0	4

- Course Objective**
1. Learn the basics of vector calculus comprising gradient, divergence, Curl and line, surface, volume integrals.
 2. Understand analytic functions of complex variables and conformal mappings.
 3. Know the basics of residues, complex integration and contour integration.
 4. Apply Laplace transform techniques to solve linear differential equations.
 5. Know the effective mathematical tools for the solutions of partial differential equations that model several physical problems in mathematical physics

Unit	Description	Instructional Hours
	VECTOR CALCULUS	
I	Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.	12
	ANALYTIC FUNCTIONS	
II	Analytic function - Cauchy-Riemann equations - sufficient conditions (excluding proof) – Harmonic - conjugate harmonic functions– Construction of analytic functions (Milne-Thompson method) – Conformal mapping: $w = z+c$, cz , $1/z$ and bilinear transformation without problems related to the concept of conformal mapping.	12
	COMPLEX INTEGRATION	
III	Complex integration – Statements of Cauchy’s integral theorem – Taylor’s and Laurent’s series expansions - Singular points – Residues – Cauchy’s residue theorem – Evaluation of real definite integrals as contour integrals around unit circle.	12
	LAPLACE TRANSFORM	
IV	Laplace transform –Basic properties – Transforms of derivatives and integrals of functions - Transforms of unit step function and impulse function – Transform of periodic functions. Inverse Laplace transform - Convolution theorem (without proof) – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.	12
	PARTIAL DIFFERENTIAL EQUATIONS	
V	Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions- Solution of standard types of first order partial differential equations of the form $f(p,q) = 0$, Clairaut’s type: $z = px + qy + f(p, q)$ – Lagrange’s linear equation- Linear homogeneous partial differential equations of second and higher order with constant coefficient.	12

Total Instructional Hours 60

- Course Outcome**
- CO1: Know the gradient, divergence and curl of vectors useful for engineering application like fluid flow, electricity and magnetism.
 - CO2: Test the analyticity to construct the analytic function and transform complex functions from one plane to another plane graphically.
 - CO3: Evaluate real and complex integrals over suitable closed paths or contours.
 - CO4: Know the applications of Laplace transform and its properties and to solve certain linear differential equations using Laplace transform technique.
 - CO5: Solve the engineering problems using Partial Differential Equations.

TEXT BOOKS:

T1- Ravish R Singh, Mukul Bhatt, “Engineering Mathematics”, McGraw Hill education (India) Private Ltd.,Chennai,2017.

T2- Veerarajan T, “Engineering Mathematics–II”, McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016

REFERENCE BOOKS:

R1-Bali N.P & Manish Goyal, “A Text book of Engineering Mathematics”, 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.

R2- Grewal B.S, “Higher Engineering Mathematics”, 42nd Edition, Khanna Publications, Delhi, 2012.

R3- Peter V. O’Neil, “Advanced Engineering Mathematics”, 7th Edition, Cengage learning, 2012.

R4-Sivarama Krishna Das P and Rukmangadachari E., “Engineering Mathematics” Vol II, Second Edition, Pearson publishing, 2011.

R5- Wylie & Barrett, “Advanced Engineering Mathematics”, McGraw Hill Education, 6th edition, 2003


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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16PH2102	PHYSICS OF MATERIALS	3	0	0	3

- Course Objective**
1. Gain knowledge about conducting materials.
 2. Provide fundamental knowledge of semiconducting materials which is related to the engineering program.
 3. Extend the properties of magnetic materials, applications and super conducting materials.
 4. Defend the various types of dielectric materials and their uses.
 5. Expose the students to smart materials and the basis of nano technology.

Unit	Description	Instructional Hours
	CONDUCTING MATERIALS	
I	Introduction – Conductors – Classical free electron theory of metals – Electrical and thermal conductivities – Wiedemann–Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.	9
	SEMICONDUCTING MATERIALS	
II	Introduction – Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors –direct and indirect band gap- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect – Determination of Hall coefficient – Applications.	9
	MAGNETIC & SUPERCONDUCTING MATERIALS	
III	Magnetic Materials: Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications. Superconducting Materials: Superconductivity: properties – Type I and Type II superconductors – BCS theory of superconductivity (Qualitative) - High Tc superconductors – Applications of superconductors – SQUIDS, cryotron, magnetic levitation.	9
	DIELECTRIC & COMPOSITES MATERIALS	
IV	Introduction – Electrical susceptibility – dielectric constant – polarization - electronic, ionic, orientation and space charge polarization –internal field – Claussius – Mosotti relation (derivation) – dielectric loss and dielectric breakdown (qualitative).Introduction – types of composites materials – Polymer, metallic and ceramic matrix composites (qualitative). Application in surgery, sports equipment.	9
	SMART MATERIALS AND NANOTECHNOLOGY	
V	New Engineering Materials: Metallic glasses – preparation, properties and applications – shape memory alloys (SMA)– characteristics, properties of NiTi alloy applications. Nano Materials: Synthesis - plasma arcing – Chemical vapour deposition – properties of nanoparicles and applications. – Carbon nano tubes – fabrication – pulsed laser deposition - Chemical vapour deposition - properties & applications	9
	Total Instructional Hours	45

- Course Outcome**
- CO1: Illustrate the electrical / thermal conductivity of conducting materials.
CO2: Understand the purpose of the acceptor or donor levels and the band gap of a semiconductor.
CO3: Interpret the basic idea behind the process of magnetism and applications of magnetic materials in every day life
CO4: Identify and compare the various types of dielectric polarization and dielectric breakdown.
CO5: Evaluate the properties and applications of various advanced engineering materials and develop the new ideas to synthesis Nanomaterials

TEXT BOOKS:

- T1 - S.O.Pillai “Solid State Physics” New Age International Publishers, New Delhi – 2011
T2 - Rajendran V “Materials Science” McGraw-Hill Education” New Delhi -2016.

REFERENCE BOOKS:

- R1 – William D Callister, Jr “Material Science and Engineering” John wiley and Sons, New York, 2014.
R2 - Raghavan, V. “Materials Science and Engineering – A First Course” Prentice Hall of India, New Delhi 2016.
R3 -Dr. G. Senthilkumar “Engineering Physics – II” VRB publishers Pvt Ltd., 2013

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CY2102	ENVIRONMENTAL SCIENCES	3	0	0	3
Course Objective	<ol style="list-style-type: none"> To gain knowledge on the importance of environmental education, ecosystem and biodiversity. To acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution. To find and implement scientific, technological, economic and political solutions to environmental problems. To study about the natural resources, exploitation and its conservation To be aware of the national and international concern for environment and its protection. 					
Unit	Description	Instructional hours				
	ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY Importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the a) Forest ecosystem b) grassland ecosystem c) desert ecosystem d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values – Biodiversity at global, national and local levels – India as a mega diversity nation – hot spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	9				
I	ENVIRONMENTAL POLLUTION Definition – causes, effects and control measures of: Air pollution – Air pollution standards – control methods – Water pollution – Water quality parameters – Soil pollution – Marine pollution – Noise pollution – Thermal pollution – Nuclear hazards – role of an individual in prevention of pollution – pollution case studies.	9				
II	NATURAL RESOURCES Forest resources: use and over exploitation, deforestation, case studies – timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Land resources: Land as resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable life styles.	9				
III	SOCIAL ISSUES AND THE ENVIRONMENT From unsustainable to sustainable development – urban problems related to energy – energy conversion – electrical energy calculations – environmental ethics: Issues and possible solutions – 12 principles of green chemistry – Current environmental issues at country level – management of municipal sewage, municipal solid waste, hazardous waste and biomedical waste – Global issues – Climate change, Acid rain, green house effect and ozone layer depletion. Disaster management: floods, earthquake, cyclone and landslides.	9				
IV	HUMAN POPULATION AND THE ENVIRONMENT Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV/AIDS – Women and child welfare – Environmental impact analysis (EIA) – GIS – remote sensing – role of information technology in environment and human health – case studies.	9				
V						
Total Instructional Hours		45				


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Course Outcome	CO1: Understand the natural environment and its relationships with human activities.
	CO2: Characterize and analyze human impacts on the environment
	CO3: Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes
	CO4: Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
	CO5: Understand and implement scientific research strategies, including collection, management, evaluation, and interpretation of environmental data.

TEXT BOOKS:

- T1- Anubha Kaushik and C. P. Kaushik, "Environmental Science and Engineering", Fourth edition, New Age International Publishers, New Delhi, 2014.
T2 - Deeksha Dave and S.S.Katewa, "Textbook of Environmental Studies", Second Edition, Cengage Learning, 2012.

REFERENCES:

- R1 - Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
R2 - G.Tyler Miller, Jr and Scott E. Spoolman "Environmental Science" Thirteenth Edition, Cengage Learning, 2010.
R3 - Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16HE2102R	ESSENTIAL ENGLISH FOR ENGINEERS – II	3	1	0	4

- Course Objective
1. The learner will be introduced to global corporate culture and professional communication.
 2. It helps the students to focus on organizing professional event and documentation.
 3. The student will be able to describe the events and process in an effective way.
 4. It trains the student to analyze the problems and to find solution to it.
 5. The learner will be familiar with business communication.

Unit	Description	Instructional Hours
I	Introduction- talking about teamwork- Making arrangements- Improving Communication in spoken language – Taking and leaving Voice mail messages (present Tense, Past Tense and Present Perfect) Talking about Business Hotel- (Speaking Activity) Talking about Corporate Hospitality- Formal and Informal Language – Making accepting and declining invitations (Auxiliary Verb, Countable or Uncountable Nouns) – Focus on Language – Definitions and Extended Definitions- Reading comprehension.	12
II	Talking about orders – Clarity Written Language – Phone and Letter Phrases – Talking about Company Finances – Conditional 1 and 2 – Managing Cash Flow (Intention and Arrangements Conditional 1 and 2) – Talking about Brands and Marketing – Ethical Banking- Talking about Public Relations – Organizing a PR Event – Describing Duties and Responsibilities – (Future Tense and Articles) – Reported Speech – Modal Verbs and Passive, Impersonal Passive Voice- interpretation of posters or advertisements.	12
III	Talking about relocation – Report Phrases – Talking about Similarity and difference- Giving Directions- Asking for Information and Making Suggestions – Talking about Location (Comparatives and Superlatives, Participles) – Talking about Company Performances- Describing Trends – Describing Cause and Effect – Talking about Environmental Impact – Discussing Green Issues – Language of Presentations (Adjectives and Adverbs, Determiners)- Homophones – Homonyms- Acronyms-Abbreviations- British and American words.	12
IV	Talking about Health and Safety – Expressing Obligation- Discussing Regulations- Talking about personnel Problems – Passives – Talking about Problem at Work (modal Verbs, Passives)- Talking about Expenses Claims- Talking about Air Travel (Relative Pronoun, Indirect Questions) – E-mail Writing - Note completion- Transcoding.	12
V	Talking about staff Benefits- Talking about Appraisal Systems (gerunds and Infinitives, Reported Speech) – Talking about Marketing Disasters – Expressing hypothetical Situations- Talking about entering Foreign Market (Conditional 3, Grammar review) – Letter for calling quotations, Replying for quotations – Placing an order and Complaint and reply to a complaint.	12
Total Instructional Hours		60

- Course Outcome
- CO1: Introduced corporate culture and professional communication.
CO2: It focused on organizing a professional event and its documentation.
CO3: Improved the ability to describe the events and process in an effective way
CO4: Trained to analyze the problems and to find solution to it.
CO5: Practiced to make business communication.

TEXT BOOKS:

- T1 - Norman Whitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate – 2nd Edition. 2014.
T2 - Ian Wood and Anne Williams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2013.

REFERENCE BOOKS:

- R1 - Communication Skills for Engineers, Sunitha Misra & C.Murali Krishna, Pearson Publishers
R2 - Technical Communication, Daniel G. Riordan, Cengage learning publishers.
R3 - Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I&II", Orient Blackswan, 2010.


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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE2101	ENGINEERING MECHANICS	3	1	0	4

The main objectives of the course are to:

- Course Objective**
1. Understand the vector and scalar representation of forces and moments
 2. Understand the static equilibrium of particles and rigid bodies both in two dimensions.
 3. Understand the principle of work and energy.
 4. Comprehend the effect of friction on equilibrium.
 5. Write the dynamic equilibrium equation.

Unit	Description	Instructional hours
I	BASICS & STATICS OF PARTICLES Introduction – Units and Dimensions – Laws of Mechanics – Lamé’s theorem, Parallelogram and triangular Law of forces – Vectors – Vector representation of forces and moments – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.	12
II	EQUILIBRIUM OF RIGID BODIES Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis– Scalar component of a moment– Varignon’s theorem – Single equivalent force – Equilibrium of Rigid bodies in two dimensions.	12
III	PROPERTIES OF SURFACES AND SOLIDS Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, - Angle section, Hollow section by using standard formula – Second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas.	12
IV	DYNAMICS OF PARTICLES Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton’s law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies. Co-efficient of restitution.	12
V	FRICTION Frictional force – Laws of Coloumb friction – Simple contact friction – Rolling resistance – Wedge friction - Belt friction, Applications of friction.	12
Total Instructional Hours		60

The outcomes of the course are the students shall have the ability:

- Course Outcome**
- CO1: To solve engineering problems dealing with force, displacement, velocity and acceleration.
 - CO2: To analyze the forces in any structure.
 - CO3: To solve rigid body subjected to dynamic forces.

TEXT BOOKS:

1. F.P.Beer, and Jr. E.R.Johnston., “Vector Mechanics for Engineers (In SI Units): Statics and Dynamics”, 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).

REFERENCE BOOKS:

1. R.C.Hibbeller, and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 11th Edition, Pearson Education 2010.
2. S.Rajasekaran and G.Sankarasubramanian, “Engineering Mechanics Statics and Dynamics”, 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.
3. S.S.Bhavikatti, and K.G.Rajashekarappa, “Engineering Mechanics”, New Age International (P) Limited Publishers, 1998.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16EE2202	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	3	0	0	3

- Course Objective**
1. To apply the basic laws used in Electrical circuits and the different components.
 2. To impart knowledge on construction and working of DC and AC machines.
 3. To provide knowledge on the fundamentals of semiconductor devices and their applications.
 4. To impart knowledge on digital electronics and its principles.
 5. To develop block diagrams for satellite and optical fiber communications.

Unit	Description	Instructional Hours
I	ELECTRICAL CIRCUITS AND MEASUREMENTS Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase circuits - Three Phase Balanced Circuits. Operating Principles of Moving Coil and Moving Iron Instruments - Ammeters and Voltmeters, Dynamometer type Watt meters and Energy meters.	9
II	ELECTRICAL MACHINES Construction, Principle of Operation of DC Generators - EMF Equation - Construction, Principle of Operation of DC shunt and series Motors, Single Phase Transformer - EMF Equation, Single phase capacitor start - capacitor run – Construction, Principle of Operation of Three Phase Induction Motor – Applications - (Qualitative Approach only).	9
III	SEMICONDUCTOR DEVICES AND APPLICATIONS Characteristics of PN Junction Diode – Zener Diode and its Characteristics – Zener Effect – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor (BJT) – CB, CE, CC Configurations and Characteristics – FET – Characteristics.	9
IV	DIGITAL ELECTRONICS Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops (RS, JK, T & D), A/D and D/A Conversion (Dual Slope, SAR, Binary-weighted and R-2R).	9
V	FUNDAMENTALS OF COMMUNICATION ENGINEERING Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations - Satellite and Optical Fibre communications (Block Diagram Approach only).	9
Total Instructional Hours		45

- Course Outcome**
- At the end of this Course, students will be able to:
- CO1: Apply the KVL and KCL in Electrical circuits
 - CO2: Explain the constructional features of AC and DC machines.
 - CO3: Identify electronics components and use of them to design circuits.
 - CO4: Use appropriate logic gates in circuit design.
 - CO5: Construct block diagram and explain satellite and optical Fibre communication systems.

- TEXT BOOKS**
- T1 - Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 1990.
 - T2 - Sedha R.S., "Applied Electronics", S. Chand & Co., 2006.
 - T3 - Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, 2006.

REFERENCES

- R1- Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press 2005.
- R2 - Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, 1994.
- R3 - Premkumar N, "Basics of Electrical Engineering", Anuradha Publishers, 2003.
- R4- T.Thyagarajan. "Fundamentals of Electrical and Electronics Engineering" Scitech Publications Pvt Ltd, 2011.

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COURSE CODE	NAME OF THE COURSE	L	T	P	C
16PS2001	PHYSICAL SCIENCES LAB – II PHYSICS LABORATORY	0	0	2	1

- Course Objective
1. Evaluate the band gap of a semiconductor.
 2. Apply the concept of interference and calculate the thickness of thin wire.
 3. Acquire the practical skills in Young's modulus by uniform bending method.

S.NO	Description of the Experiments (Any FIVE Experiments)	Practical Hours
1	Determination of Young's modulus by uniform bending method	3
2	Determination of band gap of a semiconductor	3
3	Determination of Coefficient of viscosity of a liquid –Poiseuille's method	3
4	Determination of Dispersive power of a prism - Spectrometer	3
5	Determination of thickness of a thin wire – Air wedge method	3
6	Determination of Rigidity modulus – Torsion pendulum	3
7	Magnetic hysteresis experiment	3
8	Calibration of ammeter using potentiometer	3
Total Instructional Hours		15

- Course Outcome
- CO: 1. Experiment involving the physical phenomena of the Rigidity modulus of wire.
CO: 2. Determine the band gap of a semiconductor and variation of Energy Gap (E_g) with temperature.
CO: 3 Assess the Young's modulus of a beam using non uniform bending method.
CO: 4. Explain the concept of interference and calculate the thickness of thin wire and other fine objects.
CO: 5. Experiment provides a unique opportunity to validate Dispersive power of a prism using Spectrometer.

*** Student will prepare lab record during the course of the semester.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16PS2001	PHYSICAL SCIENCES LAB – II CHEMISTRY LABORATORY	0	0	2	1

- Course Objective
1. Acquire practical skills in the quantitative analysis of water quality parameters.
 2. Acquire practical skills in the instrumental methods for quantitative estimation of metal ion content.
 3. Gain knowledge in determination of rate of corrosion.

S.No	Description of the Experiments(Any FIVE Experiments)	Practical Hours
1	Determination of Dissolved Oxygen in water by Winkler's method	3
2	Estimation of alkalinity of water sample by indicator method.	3
3	Estimation of hydrochloric acid by pH metry	3
4	Estimation of ferrous iron by Potentiometry	3
5	Estimation of copper by EDTA	3
6	Determination of sodium by flame photometry	3
7	Determination of corrosion rate of mild steel by weight loss method	3
Total Instructional Hours		15

- Course Outcome
- CO1: Determine the level of DO in a water sample.
 CO2: Identify and estimate the different types of alkalinity in water sample.
 CO3: Estimate the acidity of water sample using pH metry.
 CO4: Estimate the amount of copper in a brass sample.
 CO5: Determine the metal ion content using instrumental methods.


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16GE2001	LANGUAGE COMPETENCY ENHANCEMENT COURSE- II (COMMON TO ALL BRANCHES)	0	0	2	1
Course Objective	1. To introduce to business communication. 2. To train the students to react to different professional situations. 3. To make the learner familiar with the managerial skills 4. To empower the trainee in business writing skills. 5. To learn to interpret and expertise different content.					

Unit	Description	Instructional Hours
I	Listening and Speaking – listening and discussing about programme and conference arrangement Reading –reading auto biographies of successful personalities Writing Formal & informal email writing, Recommendations Grammar and Vocabulary - Business vocabulary, Adjectives & adverbs.	3
II	Listening and Speaking - listening to TED talks Reading - Making and interpretation of posters Writing - Business letters: letters giving good and bad news, Thank you letter, Congratulating someone on a success” Grammar and Vocabulary - Active & passive voice, Spotting errors (Tenses, Preposition, Articles).	3
III	Listening and Speaking -travel arrangements and experience Reading - travel reviews Writing - Business letters (Placing an order, making clarification & complaint letters). Grammar and Vocabulary - Direct and Indirect speech.	3
IV	Listening and Speaking - Role play - Reading - Sequencing of sentence Writing - Business report writing (marketing, investigating) Grammar and Vocabulary - Connectors, Gerund & infinitive.	3
V	Listening and Speaking - Listen to Interviews & mock interview Reading - Reading short stories, reading profile of a company - Writing - Descriptive writing (describing one’s own experience) Grammar and Vocabulary - Editing a passage(punctuation, spelling & number rules).	3
Total Instructional Hours		15
Course Outcome	CO1- Introduced to different modes and types of business communication. CO2- Practiced to face and react to various professional situations efficiently. CO3- learnt to practice managerial skills. CO4- Familiarized with proper guidance to business writing. CO5- Trained to analyze and respond to different types of communication.	

TEXT BOOKS:

T1 - Norman Whitby, “Business Benchmark-Pre-intermediate to Intermediate”, Cambridge University Press, 2016.

T2- Ian Wood and Anne Willams. “Pass Cambridge BEC Preliminary”, Cengage Learning press 2015.

REFERENCE BOOKS:

R1 - Michael Mc Carthy, “Grammar for Business”, Cambridge University Press, 2009.

R2- Bill Masculi, “Business Vocabulary in use: Advanced 2nd Edition”, Cambridge University Press, 2009.

R3- Frederick T. Wood, “Remedial English Grammar for Foreign Students”, Macmillan publishers, 2001.


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SYLLABUS


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2024-2025
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Program me	Course Code	SEMESTER III				
		Name of the Course	L	T	P	C
B.E.	16MA3103	FOURIER ANALYSIS AND STATISTICS (Common to AERO, AUTO, MECH, EEE and E&I)	3	1	0	4

- Course Objective
1. Introduce Fourier series analysis which is central to many applications in engineering.
 2. Solve boundary value problems by applying Fourier series.
 3. Acquaint with Fourier transform techniques used in wide variety of situations.
 4. Provide the necessary basic concepts of some statistical methods.
 5. Manipulate different kinds of problems occurring in engineering and technology by applying the design of experiments.

Unit	Description	Instructional Hours
	FOURIER SERIES	
I	Dirichlet's conditions- General Fourier Series – Odd and Even Functions – Half range sine and cosine series – Change of Interval - Parseval's Identity - Harmonic analysis. A spring -mass system driven by an alternating square force, A series circuit with a square wave voltage, power delivered by a periodic current and modelling radiation intensity.	12
	BOUNDARY VALUE PROBLEMS	
II	Classification – solution of one dimensional wave equation – one dimensional heat equation –steady state solutions of two dimensional heat equations (excluding insulated edges) - Fourier series solution in Cartesian coordinates.	12
	FOURIER TRANSFORMS	
III	Fourier Transform Pairs - Fourier sine and cosine transforms – Properties - Transforms of Simple functions – Convolution Theorem – Parseval's identity.	12
	TESTING OF HYPOTHESIS	
IV	Large sample test based on Normal distribution for single mean and difference of means - Tests based on t (for single mean and difference of means) - F distribution – for testing difference of variance, Chi – Square test for Contingency table (Test for Independency) – Goodness of fit	12
	DESIGN OF EXPERIMENTS	
V	One way and two way classifications - Completely randomized design – Randomized block design –Latin square design.	12
Total Instructional Hours		60

- Course Outcome
- CO1: Understand the mathematical principles of Fourier series which would provide them the ability to formulate and solve some of the physical problems of engineering.
- CO2: Acquire the knowledge of application of Fourier series in solving the heat and wave equations.
- CO3: Obtain the knowledge of Fourier transform techniques which extend its applications in Electrical circuit analysis, control system design and signal processing.
- CO4: Acquire skills in analyzing statistical methods.
- CO5: Have a clear perception of the statistical ideas and demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS:

- T1 - Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Second reprint, New Delhi, 2012.
- T2 - Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 2011.

REFERENCE BOOKS :

- R1 - C.Roy Wylie " Advance Engineering Mathematics" Louis C. Barret, 6th Edition, Mc Graw Hill Education India Private Limited, New Delhi 2003.
- R2 - Kandasamy P., Thilagavathy K. and Gunavathy K., "Engineering Mathematics Vol III", S.Chand & Company Ltd., New Delhi, 1996.
- R3 - Walpole. R.E., Myers., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007.

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H

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME3201	MANUFACTURING TECHNOLOGY – I	3	0	0	3

Course Objective

1. To introduce the concepts of some basic manufacturing processes and fabrication techniques
2. To understand the manufacturing of metal components in different methods such as metal casting.
3. To understand the metal joining, metal forming techniques.
4. To understand the bulk forming process such as forging and rolling.
5. To understand the manufacturing of plastic components.

Unit	Description	Instructional Hours
I	METAL CASTING PROCESSES Sand Casting: Sand Mould – Type of patterns - Pattern Materials – Pattern allowances –Moulding sand Properties and testing – Cores –Types and applications – Moulding machines– Types and applications; Melting furnaces: Blast and Cupola Furnaces; Special casting processes : Shell - investment – Pressure die casting - Centrifugal Casting - Continuous casting process – Stir casting; Casting Defects.	9
II	JOINING PROCESSES Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of: Resistance welding - Plasma arc welding – Thermit welding – Electron beam welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure.	9
III	BULK FORMING PROCESSES Hot working and cold working of metals – Forging processes – Open and closed die forging – forging operations. Rolling of metals– Types of Rolling mills – Flat strip rolling – shape rolling operations – Defects in rolled parts. Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion Principle of rod and wire drawing.	9
IV	SHEET METAL FORMING PROCESS Sheet metal characteristics – shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal –Special forming processes; Hydro forming – Rubber pad forming – Metal spinning– Explosive forming- Magnetic pulse forming- Peen forming- Super plastic forming – Micro forming.	9
V	MANUFACTURE OF PLASTIC COMPONENTS Types and characteristics of plastics –Thermoplastics and Thermosetting plastics – working principles and typical applications of Injection moulding, Plunger and screw machines – Compression moulding, Transfer Moulding – Blow moulding –Rotational moulding – Film blowing – Extrusion – Thermoforming – Bonding of Thermoplastics -industrial applications of plastics.	9
Total Instructional Hours		45

Course Outcome

Upon completion of this course, the students will be able to,

CO1: Apply the different manufacturing process and use this in industry for component production.
CO2: Understand and compare the functions and applications of different manufacturing process.
CO3: Know the metal joining and forming techniques.
CO4: Gain knowledge about deformation process.
CO5: Understand plastic component manufacturing.

TEXT BOOKS:

- T1 -Hajra Choudhary S.K and Hajra Choudhury. AK, "Elements of workshop Technology", volume I and II, Media promoters and Publishers Private Limited, Mumbai, 1997.
T2 -Gowri.S, Hariharan.P, SureshBabu.A, "Manufacturing Technology I", Pearson Education, 2008.

REFERENCES:

- R1 -Sharma, P.C., "A Text book of production Technology", S.Chand and Co. Ltd., 2004.
R2 -Paul Degarma E, Black J.T and Ronald A. Kosher, "Materials and Processes, in Manufacturing" 8th Ed, Prentice – Hall of India, 1997.
R3 -Rao, P.N. "Manufacturing Technology Foundry, Forming and Welding", 2nd Ed, TMH-2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME3202	ENGINEERING THERMODYNAMICS (COMMON TO MECHANICAL AND AUTOMOBILE ENGINEERING)	3	1	0	4

- Course Objective**
1. Understand and quantify the energy conversion.
 2. Understand the energy degradation in thermodynamic systems.
 3. Understand the behavior of pure substances and working principle of steam power cycles.
 4. Understand the thermodynamic relations.
 5. Understand the properties of atmospheric air and its applications.

Unit	Description	Instructional Hours
	BASIC CONCEPTS AND FIRST LAW	
I	Basic concepts - concept of continuum, microscopic and macroscopic approach, path and point functions. Intensive and extensive, total and specific quantities, thermodynamic system, equilibrium, state, path and process. Quasi-static, reversible and irreversible processes. Heat and work transfer, definition and comparison, sign convention. Displacement work and other modes of work .P-V diagram. Zeroth law of thermodynamics – concept of temperature and thermal equilibrium. First law of thermodynamics –application to closed and open systems – steady and unsteady flow processes.	12
	SECOND LAW AND AVAILABILITY ANALYSIS	
II	Heat Reservoir, source and sink. Heat Engine, Refrigerator, and Heat pump. Statements of second law and its corollaries. Carnot cycle, Reversed Carnot cycle, Performance, Clausius inequality. Concept of entropy, T-s diagram, Tds Equations, entropy change of - pure substance, ideal gases – different processes, principle of increase in entropy and availability analysis.	12
	PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE	
III	Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Estimation of steam properties. Ideal and actual Rankine cycles, Cycle Improvement Methods - Reheat and Regenerative cycles, Economiser, Preheater.	12
	IDEAL, REAL AND GASES GAS MIXTURES AND THERMODYNAMIC RELATIONS	
IV	Properties of Ideal and real gases, Equations of state, Vander Waals equation for ideal and real gases, reduced properties, Compressibility factor, Generalised Compressibility Chart and its use. Gas mixtures – mole and mass fractions, Daltons law, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation.	12
	PSYCHROMETRY	
V	Psychrometric properties, Property calculations of air vapour mixtures using psychrometric chart and expressions. Psychrometric process: sensible heating and cooling, humidification, dehumidification, adiabatic saturation, adiabatic mixing of two streams. Applications: evaporative coolers, drying, cooling towers etc.	12
Total Instructional Hours		60

- Course Outcome**
- Upon completion of this course, the students will be able to:
- CO1: Understand the thermodynamic principles and its applications.
CO2: Quantify the energy conversion in various thermal systems.
CO3: Identify the losses and inefficient components in the thermodynamic system.
CO4: Apply the thermodynamic principles for predicting the properties of steam, gas and gas mixtures.
CO5: Apply the psychrometric principles for design of air conditioning systems.

TEXT BOOK:

- T1 - Nag.P.K., "Engineering Thermodynamics", 4th Edition, Tata McGraw-Hill, New Delhi, 2008.
T2 - Cengel. Y. and MBoles, "Thermodynamics - An Engineering Approach", 7th Edition, TataMcGraw Hill, 2010.

REFERENCES:

- R1 - Natarajan E., "Engineering Thermodynamics: Fundamentals and Applications", Anuragam Publications, 2012.
R2 - Holman.J.P., "Thermodynamics", 3rd Edition. McGraw-Hill, 1995.


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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16ME3203	FLUID MECHANICS AND MACHINERY	3	1	0	4

- Course Objective**
1. To understand the behavior of fluid particles under rest and moving conditions.
 2. To study important concept of flow through pipes.
 3. To gain knowledge about the Dimensional and model analysis.
 4. To learn about the performance of pump and its types.
 5. To know the design considerations of Turbine.

Unit	Description	Instructional Hours
I	FLUID PROPERTIES AND FLOW CHARACTERISTICS Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension, capillarity, vapor pressure and cavitation. Fluid Flow-continuity equation, Euler's equation, Bernoulli's theorem and its applications, momentum equation, moment of momentum equation. Pascal's law-Pressure measurement and flow measurement devices (Description only).	12
II	BOUNDARY LAYER CONCEPT AND FLOW THROUGH PIPES Boundary layer concepts – types of boundary layer thickness- Losses of energy in pipes -Moody diagram- Darcy Weisbach equation –friction factor– Flow through pipes in series, parallel and equivalent pipe. Hydrostatic forces on surfaces-plane surfaces.	12
III	DIMENSIONAL AND MODEL ANALYSIS Dimensions, Dimensional homogeneity, methods of dimensional analysis-Rayleigh and Buckingham's- π theorem – Model analysis- Similitude –types of similarities - classification of models.	12
IV	PUMPS Classifications of pumps –Centrifugal pumps– work done by the impeller -Head and efficiencies- performance curves-velocity triangles - Multistage pumps - priming- Reciprocating pump-slip, Indicator diagram, Air vessel – Rotary pumps (Description only).	12
V	TURBINES Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- work done by water on the runner – draft tube. Specific speed– performance curves.	12
Total Instructional Hours		60

- Course Outcome**
- At the end of the course The Students will be able to,
- CO1: Apply the properties of fluids and flow characteristics.
 - CO2: Apply the momentum principle and losses in pipes in solving real life problems.
 - CO3: Perform the Dimensional and Model analysis.
 - CO4: Design suitable types of pumps for various applications.
 - CO5: Analyze the performance of various hydraulic turbines.

TEXT BOOKS:

- T1 - Yunus A Cengel & John M. Cimbala, Fluid Mechanics-Fundamentals & Applications, 2nd Edition, Tata McGraw Hill Edition, New Delhi.
- T2 - Bansal R.K., —Fluid Mechanics and Hydraulic Machines, 9th Edition, Laxmi Publications, New Delhi, 2015.

REFERENCE BOOKS:

- R1 - Som S.K., Biswas G., —Introduction to Fluid Mechanics and Fluid Machines, 2nd Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007.
- R2 - Ramamrutham.S and Narayanan.R., "Fluid Hydraulics and Fluid Machines", Dhanpat rai Publishing House (P) Ltd., New Delhi, 2012.
- R3 – Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2004.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME3204	STRENGTH OF MATERIALS (COMMON TO MECHANICAL AND AUTOMOBILE ENGINEERING)	3	0	0	3

- Course Objective**
1. To study the principles of simple stress, strain and deformation in components.
 2. To assess stresses and deformations through mathematical models of beams.
 3. To learn about torsion of components.
 4. Gain knowledge about deflections on beams.
 5. Understand the stress analysis concepts in two dimension objects.

Unit	Description	Instructional Hours
	STRESS- STRAIN AND DEFORMATION OF SOLIDS 12	
I	Rigid and Deformable bodies – Mechanical Properties – Stress-Strain Curve - Tension, Compression and Shear stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains, Principal Planes & Stresses - Mohr's circle.	9
	BEAMS - LOADS AND STRESSES 12	
II	Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever, Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Transverse shear stresses in beams.	9
	TORSION	
III	Formulation-stress and deformation in circular and hollow shafts – Stepped shaft – Deflection in shaft subjected to various boundary conditions–Stresses in helical springs – Deflection of helical springs, Leaf springs.	9
	BEAM DEFLECTION	
IV	Double integration method – Macaulay Method – Area moment Method for computation of slopes and deflection in beams – Conjugate beam and Strain Energy problems.	9
	ANALYSIS OF STRESSES IN TWO DIMENSIONS	
V	Stresses in Thin cylindrical shell due to internal pressure, Circumferential and Longitudinal stresses and deformation in Thin Cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells.	9
Total Instructional Hours		45

- Course Outcome**
- CO1: Apply mathematical knowledge to estimate the deformation behavior of simple structures.
CO2: Calculate shear force and bending moment in different types of beams.
CO3: Determine torsion in shafts and stresses in various types of springs.
CO4: Analyze deflection in various beams.
CO5: Estimate the stresses developed in cylinders and spherical shells.

TEXT BOOKS:

- T1 -Bansal.R.K, "Text Book of Strength of Materials", Laxmi Publications, New Delhi, 2017.
T2 -Khurmi.R.S, "Strength of Materials", S.Chand Publications, 2016.

REFERENCE BOOKS:

- R1 - Beer F. P. and Johnston R, "Mechanics of Materials", McGraw-Hill Book Co, Third Edition, 2002.
R2 - Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., Tata McGraw-Hill Publishing Co.
R3 - Ryder G.H, "Strength of Materials, Macmillan India Ltd", Third Edition, 2002.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EE3231	ELECTRICAL DRIVES AND CONTROLS	3	0	0	3

- Course Objective**
1. Acquire the fundamentals of the electrical drive system.
 2. Learn the Different speed control methods of electrical drive system.
 3. Identify the various starters and controllers for electrical motors.
 4. Gain the knowledge on speed control methods for electrical drives.
 5. Study the power electronics based speed control of electrical drives

Unit	Description	Instructional Hours
	INTRODUCTION	
I	Basic Elements – Types of Electric Drives – factors influence the choice of electrical drives – Heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors.	9
	DRIVE MOTOR CHARACTERISTICS	
II	Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors. (Only elementary aspects of the above types are expected).	9
	STARTING METHODS	
III	Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors, Control devices.	9
	CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES	
IV	Speed control of DC series and shunt motors - Ward-Leonard control system - Using controlled rectifiers and DC choppers –applications. (Qualitative Treatment).	9
	CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES	
V	Speed control of three phase induction motor –VFD motor– Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications. (Qualitative Treatment).	9
Total Instructional Hours		45

- Course Outcome**
- CO1: Identify the basic components of electric drive systems.
CO2: Describe the performance characteristics of electrical motor.
CO3: Design the starters for electrical motors used in drives.
CO4: Apply the speed control techniques of electrical drives.
CO5: Investigate the power converter based speed control of AC & DC drives.

TEXT BOOKS:

- T1 - Vedam Subrahmaniam, "Electric Drives (Concepts and Applications)", Tata McGraw-Hill, 2001.
T2 - Gopal K. Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.

REFERENCE BOOKS:

- R1 - De. N.K and Sen.P.K 'Electric Drives' Prentice Hall of India Private Ltd, 2002.
R2 - Pillai.S.K "A First Course on Electric Drives", Wiley Eastern Limited, 1998.
R3 - Nagrath .I.J. & Kothari .D.P, "Electrical Machines", Tata McGraw-Hill, 1998.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME3002	SOLID AND FLUID MECHANICS LAB	0	0	4	2

- Course Objective**
1. Apply the knowledge gained on flow meters by experiments.
 2. Understand the characteristics of pumps and turbines through practical learning.
 3. To familiarize with the working of pumps and turbines through practical learning.
 4. Understand the materials behavior and strength due to tension, compression and torsion by Experiments.
 5. Carry out the tests of materials before selecting for a particular application.

Expt. No.	Description of the Experiments	Total Practical Hours
1.	Determination of the Coefficient of discharge of given Venturi meter & Orifice meter.	
2.	Determination of friction factor of a pipe.	
3.	Conducting experiments and drawing the characteristic curves of Centrifugal pump or Submersible pump.	
4.	Conducting experiments and drawing the characteristic curves of reciprocating pump.	
5.	Conducting experiments and drawing the characteristic curves of Pelton wheel.	
6.	Conducting experiments and drawing the characteristics curves of Francis turbine.	
7.	Tension test on given specimen using universal testing machine.	
8.	Deflection test on beams.	
9.	Torsion test on given specimen.	
10.	Hardness tests (Brinels and Rockwell).	
11.	Compression test on helical springs.	
12.	Testing of impact resistance of steels.	
Total Practical Hours		45

- At the end of the course, the student can
- Course Outcome**
- CO1: Determine the performance characteristics of pumps and turbines.
 - CO2: Demonstrate the flow rate of venturi meter and orifice meter.
 - CO3: Evaluate the material behavior and strength due to tension, compression and torsion by experiments.
 - CO4: Carryout various tests of materials.
 - CO5: Examine the properties of materials before selecting for a particular application.


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Programme	Course Code	SEMESTER – IV				
		Name of the Course	L	T	P	C
B.E.	16MA4107	NUMERICAL METHODS (Common to AERO, AUTO, MECH, EEE & EIE)	3	1	0	4

- Course Objective
1. Solve algebraic, transcendental and system of linear equations by using various techniques.
 2. Apply various methods to find the intermediate values for the given data.
 3. Be Familiar with the concepts of numerical differentiation and numerical integration of the unknown functions.
 4. Understand the concept of solving Ordinary differential equations by applying single and multi step methods.
 5. Appraise the methods introduced in the solution of ordinary differential equations and partial differential equations.

Unit	Description	Instructional Hours
I	SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS Solution of equation – Fixed point iteration : $x = g(x)$ method – Newton-Raphson method – Solution of linear system by Gauss Elimination and Gauss Jordan method – Iterative method : Gauss seidel method.	12
II	INTERPOLATION Interpolation: Newton’s forward and backward difference formulae – Lagrangian interpolation for unequal intervals – Divided difference for unequal intervals : Newton’s divided difference formula.	12
III	NUMERICAL DIFFERENTIATION AND INTEGRATION Differentiation using interpolation formula – Newton’s forward and backward interpolation formulae for equal intervals – Newton’s divided difference formula for unequal intervals - Numerical integration by Trapezoidal and Simpson’s 1/3 and 3/8 rules – Romberg’s method – Double integration using Trapezoidal and Simpson’s rules	12
IV	INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS Single step methods: Taylor’s series method – Euler and Modified Euler methods for first order equation – Fourth order Runge- kutta method for solving first order equations – Multi step method: Milne’s predictor and corrector method and Adam – Bash forth predictor corrector method.	12
V	BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional Wave equation – Two dimensional Heat equations – Laplace and Poisson Equations.	12
Total Instructional Hours		60

- Course Outcome
- CO1: Solve the system of linear algebraic equations representing steady state models and non linear equations arising in the field of engineering.
CO2: Understand the concept of interpolation in both cases of equal and unequal intervals.
CO3: Express the information from discrete data set through numerical differentiation and summary information through numerical integration.
CO4: Classify and solve ordinary differential equations by using single and multi step methods.
CO5: Acquire knowledge of finding the solution of ordinary and partial differential equations which are useful in attempting any engineering problems.

TEXT BOOKS:

- T1 - Sankara Rao K, “Numerical Methods for Scientists and Engineers”, 3rd edition, Prentice Hall of India Private limited, New Delhi, 2007..
T2 - M.K.Jain, S.R.K.Iyengar, R.K.Jain “Numerical methods for Scientific and Computation”, Fifth Edition, New Age International publishers 2010.

REFERENCE BOOKS :

- R1 - Kreyszig.E. “Advanced Engineering Mathematics”, Eight Edition, John Wiley and sons (Asia) limited.
R2 - Grewal B.S. and Grewal J.S. “Numerical Methods in Engineering and Science “, 6th Edition , Khanna publishers, New Delhi 2004.
R3 - S.K.Gupta, Numerical Methods for Engineers” , New Age International Pvt.Ltd Publishers, 2015.

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**Dean (Academics)
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME4201	MANUFACTURING TECHNOLOGY – II	3	0	0	3

- Course Objective**
1. To provide an overview of Metal Cutting Theory concepts.
 2. To educate students on the working and various functions of Turning Machines.
 3. To give exposure about Shaping, Milling and Gear cutting machines.
 4. To provide knowledge about grinding and broaching machines.
 5. To provide the basic concepts in CNC machines.

Unit	Description	Instructional Hours
I	THEORY OF METAL CUTTING Mechanism of metal cutting – types – cutting force – chip formation – Merchant’s circle diagram – calculations – tool geometry – machinability – tool wear – tool life – cutting tool materials – cutting fluids – types.	9
II	TURNING MACHINES Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments. Capstan and turret lathes- tool layout – automatic lathes: semi-automatic – single spindle: Swiss type, automatic screw type – multi spindle.	9
III	SHAPER, SLOTTING, MILLING AND GEAR CUTTING MACHINES Shaper - Types of operations. Slotting machine- Types of operations. Milling operations-types of milling cutter. Gear cutting – forming and generation principle and construction of gear milling, hobbing and gear shaping processes –finishing of gears. Drilling machine - Types of operations.	9
IV	ABRASIVE PROCESS AND BROACHING Grinding, broaching, spinning: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications. Broaching machines: broach construction – push, pull, surface and continuous broaching machines and its applications. Super finishing – honing and lapping.	9
V	CNC MACHINING Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining.	9
Total Instructional Hours		45

- Course Outcome**
- At the end of the course, the students can,
- CO1: Apply the basics of Manufacturing machine tools and metal cutting theory to select suitable operation.
CO2: Fabricate engineering components using various lathes and special attachments.
CO3: Acquire the various special machine tool construction and operations.
CO4: Acquire the knowledge about abrasive process and gear cutting operations.
CO5: Acquire knowledge about the CNC machine tools.

TEXT BOOKS:

- T1 -Hajra Choudhury, "Elements of Workshop Technology", Vol.II., Media Promoters.
T2 -Rao. P.N "Manufacturing Technology - Metal Cutting and Machine Tools", Tata McGraw-Hill, New Delhi, 2003.

REFERENCES:

- R1 -HMT, "Production Technology", Tata McGraw Hill, 1998.
R2 -GeofreyBoothroyd, "Fundamentals of Metal Machining and Machine Tools", Mc Graw Hill, 1984.
R3 - Roy. A.Lindberg, "Process and Materials of Manufacture," Fourth Edition, PHI/Pearson Education 2006.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME4202	THERMAL ENGINEERING	3	0	0	3

- Course Objective**
1. To integrate the concepts, laws and methodologies from the first course in thermodynamics into analysis of cyclic processes.
 2. To familiarize with the types and working principles of two stroke and four stroke engines.
 3. To apply the thermodynamic concepts to IC Engines and its components.
 4. To apply the thermodynamic laws to steam turbines, steam nozzles and air compressors.
 5. To give exposure on refrigeration cycles and psychometry.

Unit	Description	Instructional Hours
	GAS POWER CYCLES	
I	Otto, Diesel, Dual, Brayton and Stirling cycles, Calculation of mean effective pressure, and air standard efficiency - Comparison of cycles.	8
	INTERNAL COMBUSTION ENGINES	
II	Classification - Components and their functions. Valve timing and port timing diagrams – actual and theoretical p-V diagrams of four stroke and two stroke engines. Fuel supply systems for SI and CI engines. Types of ignition systems- Principles of Combustion and knocking in SI and CI Engines. Lubrication and Cooling systems. Performance calculations of IC engines, Engine test methods, Emission norms.	10
	STEAM NOZZLES AND TURBINES	
III	Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow. Impulse and Reaction principles, compounding, velocity diagram for simple steam turbines, speed regulations –Governors.	9
	AIR COMPRESSOR, FANS AND BLOWERS	
IV	Classification and working principle of various types of compressors, work of compression with and without clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency of reciprocating compressors, Multistage air compressor and inter cooling –work of multistage air compressor, Fans-types, Blower-types and its industrial applications.	9
	REFRIGERATION AND AIR CONDITIONING	
V	Vapour compression cycle, Sub cooling and super heating, refrigerants, performance calculations - working principle of vapour absorption system (Ammonia –Water, Lithium bromide – water systems - Description only).	9
	Air conditioning system - types and working principle. Cooling load calculations: SHF, RSHF, GSHF, ESHF, bypass factor.	
Total Instructional Hours		45

- Course Outcome**
- Upon completion of the course, the students will be able to
- CO1: Understand the process of air standard cycles.
 - CO2: Demonstrate knowledge of the operating characteristics of common internal combustion engines.
 - CO3: Apply the thermodynamic laws to various thermal equipments like steam nozzles and steam turbines.
 - CO4: Understand the types of compressors, fans and blowers and its applications.
 - CO5: Understand the principles of air-conditioning system and estimate the cooling loads.

TEXT BOOKS:

- T1 - Rajput. R. K., "Thermal Engineering" S.Chand Publishers, 2000 Third edition, 2015.
T2 - Kothandaraman.C.P., Domkundwar. S, Domkundwar. A.V., "A course in thermal Engineering",

Fifth Edition,"Dhanpat Rai & sons, 2002.

REFERENCE BOOKS:

- R1 - Arora.C.P,"Refrigeration and Air Conditioning," Tata McGraw-Hill Publishers 1994.
R2 - Ganesan V." Internal Combustion Engines", Third Edition, Tata McGraw-Hill 2007.
R3 - Rudramoorthy, R, "Thermal Engineering ", Tata McGraw-Hill, New Delhi, 2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME4203	KINEMATICS OF MACHINERY	3	1	0	4

- Course Objective**
1. To understand the purpose of kinematics, Kinematic joint and mechanism and to study the relative motion of parts in a machine without taking into consideration the forces involved.
 2. To understand the velocity and acceleration concepts and the methodology using graphical methods and principles and application of four bar chain and slider crank Mechanism.
 3. To understand the theories and applications of cams.
 4. To understand applications of different types of gears and gear profiles and its efficiency and gear trains.
 5. To understand principles of friction applied to screw threads, clutches, brakes, belt and rope drives.

Unit	Description	Instructional Hours
	BASICS OF MECHANISMS	
I	Introduction - Links - Pairs - Chain - Mechanism - Machine structure - Degrees of freedom - Four bar chains - Terminology and definition - Planar, Spherical and Spatial Mechanisms - Grashoff's law - Kutzbach criterion - Grubler's criterion for plane mechanism. Inversion of mechanisms - Four bar, single slider crank and double slider crank mechanisms - Simple problems -Mechanical advantage – Transmission Angle – Description of some common mechanisms – Quick return mechanisms, Dwell mechanisms, Ratchets and Escapements, Universal Joint.	12
	KINEMATICS OF LINKAGE MECHANISMS	
II	Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method – Velocity and acceleration polygons – Velocity analysis using relative velocity method- Coriolis component of Acceleration.	12
	KINEMATICS OF CAM MECHANISMS	
III	Types of cams and followers - Follower motion - Uniform, Parabolic, SHM and cycloidal. Cam terminology - Cam profiles construction for roller, flat faced and knife edge follower types - pressure angle - Derivatives of Follower motion - High speed cams - circular arc and tangent cams – Standard cam motion - Pressure angle and undercutting - Sizing of Cams.	12
	GEARS AND GEAR TRAINS	
IV	Law of toothed gearing – Involute and cycloidal tooth profiles – Spur Gear terminology and definitions – Gear tooth action – contact ratio – Interference and undercutting – Non-standard gear teeth – Helical, Bevel, Worm, Rack and Pinion gears – Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains – Differentials – Automobile gear box.	12
	FRICITION	
V	Surface contacts –Friction in screw threads -Friction clutches -Belt and rope drives, Friction aspects in Brakes.	12
Total Instructional Hours		60

- Course Outcome**
- CO1: Classify mechanisms and inversions and determine mobility of a mechanism.
CO2: Estimate velocity and acceleration by graphical and analytical methods.
CO3: Construct cam profiles for various followers and their motions.
CO4: Classify various gear trains and apply to automation.
CO5: Apply friction principles to clutches, belt, brake and screw.

TEXT BOOKS:

- T1 -Ratan.S.S, "Theory of Machines", Tata McGraw Hill Publishing company Ltd., 2nd Edition, 2005.
T2 -Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 3rd Edition, 1984.

REFERENCE BOOKS:

- R1 -Shigley.J.E, and Uicker.J.J, "Theory of Machines and Mechanisms", McGraw Hill, 1995.
R2 -Ghosh.A, and Mallick.A.K, "Theory of Mechanisms and Machines", Affiliated East-West Pvt Ltd., New Delhi, 1988.
R3 -Rao.J.S, and Dukkupati.R.V, " Mechanism and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1995
R4 -Khurmi R.S., "Theory of Machines" Khanna Publishers, Delhi, 2006.


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME4204	ENGINEERING MATERIALS AND METALLURGY	3	0	0	3

- Course Objective**
1. To Learn materials are formed and their classification based on atomic arrangement.
 2. To Study the mechanical behavior of metallic and its Importance.
 3. To study the mechanical behavior of metals.
 4. To Gain knowledge on different types of materials and their applications.
 5. To Study the properties of nonferrous alloys, polymers and ceramics.

Unit	Description	Instructional Hours
	BASIC CONCEPTS	
I	Introduction to Materials Science, Defects-Point, Line, Area, Volume-Slip planes and slip systems, Schmidt's rule, Polymorphism and allotropy -Solidification-Nucleation and Growth mechanism, Cooling curve of pure metal and alloy.	9
	PHASE DIAGRAMS AND PHASE TRANSFORMATION	
II	Phase, Gibbs's Phase rule, Solubility and Solid Solutions -Iso-morphous alloy system -Binary Eutectic alloy system (Lead-Tin System), Eutectoid and Peritectic system, Iron-Iron carbide phase diagram-Invariant reactions, Evolution of Microstructure, Phase Transformation-Temperature-Time-Transformation (TTT) and Continuous Cooling Transformation (CCT) Diagrams -Steels, Cast Irons and Stainless steels -types and applications -Effects of alloying elements.	9
	HEAT TREATMENT & SURFACE HEAT TREATMENTS	
III	Heat Treatment -Annealing and its types, Normalizing, Aus-tempering, Mar-tempering, Quenching and Temper heat treatment, Hardenability -Basic concepts of wear and corrosion & their types - Surface hardening processes -Flame and induction hardening, Carburizing, Nitriding and Carbonitriding.	9
	MECHANICAL PROPERTIES OF MATERIALS	
IV	Tension, Compression, Shear and Tensional Test of Metals -Stress-strain behavior of ferrous & non-ferrous metals, polymer and ceramics -True stress and strain relations -Flexural Test, Hardness measurement tests, Fracture of metals -Ductile Fracture, Brittle Fracture, Fatigue -Endurance limit of ferrous and non-ferrous metals -Fatigue test; Creep and stress rupture-mechanism of creep -stages of creep and creep test, Strengthening.	9
	NON FERROUS ALLOYS & ADVANCED MATERIALS	
V	Non Ferrous Alloys of Aluminum, Magnesium, Copper, Nickel, Titanium -Microstructure and mechanical property relationships; Composites Classification, Processing, Metal Matrix, Ceramic Matrix, polymer matrix -properties and applications; Ceramics -Alumina, Zirconium, Silicon Carbide, Sialons, Reaction Bonded Silicon Nitride(RBSN), Processing, properties and applications of ceramics, Glasses -properties and applications.	9
Total Instructional Hours		45

- Course Outcome**
- CO1: Visualize the basic concepts in material science.
 CO2: Analyze phase diagrams and explain iron-carbon equilibrium diagram.
 CO3: Select an appropriate heat treatment process to impart a desired property for a given ferrous alloy.
 CO4: Analyse the various mechanical properties of materials.
 CO5: Select an appropriate alloying element to impart a desired property for a given non ferrous alloy.

TEXT BOOKS:

- T1 - Callister.W.D., Jr., (2010), Materials Science and Engineering: An Introduction, 8th ed., Wiley & Sons.
 T2 - William F. Smith and Javad Hashemi (2004), Foundations of Materials Science and Engineering 4th ed., Mc Graw Hill

REFERENCE BOOKS:

- R1 - Anderson.C, K.D. Leaver, P. Leavers and R.D. Rawlings, (2003), Materials Science for Engineers, 5th edition, Tata McGraw Hill Publishers
 R2 - Sidney H Avner, (2005) "Introduction to Physical Metallurgy, Tata McGraw Hill Publishing Company Limited
 R3 - Krishnan K. Chawla, (2007) Composite materials, Science and Engineering 2nd edition, Springer

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME4205	MACHINE DRAWING	1	4	0	3

- Course Objective**
1. To impart the knowledge of limits, fits and tolerances, orthographic-sectional and assembly drawing procedures.
 2. To provide the practice to draw assembly orthographic views of various machine parts.
 3. To provide the practice and develop the detailed part drawing.
 4. Understand the shape and structure of different types of screws, keys and Couplings.
 5. To provide the practice and develop the detailed mechanical components drawing.

Unit	Description	Instructional Hours
I	LIMITS, FITS AND TOLERANCES Limit System- Tolerance, Limits , Deviation, Actual Deviation, Upper Deviation, Lower Deviation, Allowance, Basic Size, Design Size, Actual Size. Fits-Types, Tolerances of Form and Position-Form and Position Variation, Geometrical Tolerance, Tolerance Zone, Indicating Geometrical Tolerances. Indication of Surface Roughness, Standard Abbreviations and Symbols used in industries.	5
II	SECTIONAL VIEWS Sections- Hatching of Sections, Cutting Planes, Revolved or Removed Section, Sectional Views- Full Section, Half Sections and Auxiliary Sections.	5
III	MACHINE ELEMENT DRAWINGS Drawing standards and Designation of Bolts, nuts, screws, keys, pins, Rivets, Welded Joints- Dimensioning of Welds, Belt Driven Pulleys, Chain and Gears Drives.	7
IV	DRAWINGS OF VARIOUS VIEWS Shaft joints: Cotter joint and Knuckle joint. Keys & Shaft coupling: Flanged, Flexible, Universal and Oldhams coupling. Shaft bearing: Solid and bush bearing, Plummer block, Footstep bearing. Pulley: Belt pulley, V belt pulley, Fast and loose pulley, Speed cone pulley, Built up pulley.	14
V	ASSEMBLY DRAWING OF MECHANICAL COMPONENTS Lathe Tail stock, Machine Vice, Pipe Vice, Simple Eccentric, Screw jack, Stuffing Box, Plummer Block, Swivel Bearing and Safety Valve.	14
Total Instructional Hours		45

- Course Outcome**
- Students should be able to:
1. Use limits, fits and tolerances, orthographic-sectional and assembly drawing procedures in real world problems.
 2. Apply sectional view, assembly and orthographic concepts to draw various machine parts.
 3. Understand the Concept of fasteners and different joints.
 4. Draw and demonstrate the projections and sectional views of various mechanical elements.
 5. Construct assembly drawings of mechanical components.

TEXT BOOKS:

- T1. Narayana K.L. and Kannaiah P., —Machine Drawing, 4th Edition, New Age International Publishers Ltd., New Delhi, 2010.
- T2. Gopalakrishna K.R., —Machine Drawing, 22nd Edition, Subhas Publications, New Delhi, 2013.

REFERENCE BOOKS:

- R1. Bhatt N.D. and Panchal V.M., —Machine Drawing, 45th Edition, Charotar Publishing House Pvt. Ltd., Gujarat, 2010.
- R2. Sidheswar N., Kannaiah P., Sastry V.V., —Machine Drawing, 27th Reprint, Tata-McGraw Hill Education, Chennai, 2004.
- R3. Faculty of Mechanical Engineering —Design Data, Revised Edition 1978, Reprint on October 2011, Kalaikathir Achchagam, 2011.


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME4002	THERMAL ENGINEERING LAB - I	0	0	4	2


- Course Objective**
1. To study the valve timing and port timing diagram.
 2. To understand the basic concepts and working of IC engines.
 3. To study the characteristics of fuels/Lubricants used in IC engines.
 4. To learn the principle of emission measurement using Orsat apparatus.
 5. To study the Performance of steam generator/turbines.

Expt. No. Description of the Experiments

1. Valve Timing and Port Timing diagrams.
2. Performance Test on 4 – stroke Diesel Engine.
3. Heat Balance Test on 4 – stroke Diesel Engine.
4. Morse Test on Multi-cylinder Petrol Engine.
5. Retardation Test on a Diesel Engine.
6. Determination of Flash Point and Fire Point of various fuels / lubricants.
7. Determination of calorific value of various fuels.
8. Determination of viscosity of fuels.
9. Performance test on reciprocating air compressor.
10. Performance test on centrifugal blower.
11. Determination of exhaust gas composition by Orsat apparatus.

Total Practical Hours 45

- Course Outcome**
- Upon completion of the course, the students will be able to
- CO1: Demonstrate the principles of spark ignition and compression ignition engines.
 - CO2: Determine various performance parameters of Internal Combustion Engines.
 - CO3: Determine the performance of air compressors.
 - CO4: Compute the properties of fuels and lubricating oils.
 - CO5: Estimate the emission levels of fuels using Orsat apparatus.


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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME4701	COMMUNICATION SKILLS LAB (ECE, MECH & B.Tech. IT)	0	0	2	1

- Course Objective**
1. Enable learners to understand different genres of oral presentation.
 2. Empower the student to improve their ability to speak in formal forum without hesitation.
 3. Make the students to read, interpret and analyze different types of writings.

Expt. No.	Description of the Experiments
1.	Listening to lectures, discussions, talk shows and news programmes.
2.	Watching videos on interesting events and interpreting it
3.	Conversational skills (formal and informal)
4.	Group discussion
5.	Interview skills
6.	Making presentations
7.	Reading different genres of texts ranging from newspapers to philosophical treatises
8.	Reading strategies such as graphic organizers, summarizing and interpretation
9.	Writing job applications – cover letter – resume
10.	Writing reports & Writing for publications.
11.	Intercultural communication
12.	Creative and critical thinking.

Total Practical Hours 45

- Course Outcome**
- CO1- It enables learners to understand different genres of oral presentation.
CO2- Empowered the student to improve their ability to speak in formal forum without Hesitation.
CO3- Students read, interpret and analyze different types of writings.
CO4- Enhances the performance of students on formal writing.
CO5- Equips the learners in practicing better soft skills.

REFERENCE BOOKS:

- R1 - Anderson, P.V., Technical Communication, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
R2 - Prakash, P., Verbal and Non-Verbal Reasoning, Macmillan India Ltd., Second Edition, New Delhi, 2004.
R3 - John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi, 2004.

TEACHING METHODS:

1. To be totally learner-centric with minimum teacher intervention as the course revolves around practice.
2. Suitable audio/video samples from Podcast/YouTube to be used for illustrative purposes.
3. Portfolio approach for writing to be followed. Learners are to be encouraged to blog, tweet, text and email employing appropriate language.
4. GD/Interview/Role Play/Debate could be conducted off the laboratory (in a regular classroom) but learners are to be exposed to telephonic interview and video conferencing.
5. Learners are to be assigned to read/write/listen/view materials outside the classroom as well for gaining proficiency and better participation in the class.

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Semester – I

Course Code & Name : 16MA1101/ Engineering Mathematics I

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	1	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	1
Avg	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

Course Code & Name : 16PH1101/ Engineering Physics

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	2	2	1	1	1	-	-	-	-	-	1	2	1
CO2	3	3	1	1	2	-	-	-	-	-	-	1	3	3
CO3	3	2	1	2	2	-	-	-	-	-	-	1	3	3
CO4	3	2	3	2	3	1	-	-	-	-	-	1	2	2
CO5	3	2	3	2	2	2	-	-	-	-	-	1	2	3
Avg	3	2.2	2	1.6	2	1.3	-	-	-	-	-	1	2.4	2.4

Course Code & Name : 16CY1101/ Engineering Chemistry

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	2	2	-	2	1	1	-	-	-	-	1	1	1
CO2	3	2	2	-	2	1	-	-	-	-	-	1	1	-
CO3	3	2	2	-	2	1	1	-	-	-	-	1	1	-
CO4	3	2	2	2	2	1	-	-	-	-	-	1	1	1
CO5	3	2	2	-	2	1	-	-	-	-	-	1	1	1
Avg	3	2	2	2	2	1	1	-	-	-	-	1	1	1

Course Code & Name : 16HE101R Essential English for Engineers - I

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	1	1	1	2	-	1	2	1	2	3	1	3	3	2
CO2	1	2	1	1	1	2	1	1	1	3	1	2	2	3
CO3	1	2	1	1	1	2	1	1	2	3	1	2	2	2
CO4	1	1	-	1	1	1	1	1	2	3	1	2	3	3
CO5	-	1	1	1	1	1	1	2	2	3	1	2	2	2
Avg	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4

Course Code & Name : 16GE1103/ Problem Solving and Python Programming

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3	-	2	-	-	-	2	-	-	2	2	2

Course Code & Name : 16ME1102 Engineering Graphics

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	3	-	1	-	1
CO2	3	2	2	-	-	-	-	-	-	2	-	-	-	1
CO3	3	2	3	-	2	-	-	-	-	2	-	1	-	2
CO4	3	2	3	-	2	-	-	-	-	2	-	-	2	2
CO5	3	2	3	-	2	-	-	-	-	2	-	-	2	2
Avg	3	2	2.6	0	2	0	0	0	0	2.2	0	1	2	1.6

Course Code & Name : 16PS1001/ Physical Science Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	-	-	-	-	-	1	2	1
CO2	3	3	1	1	2	-	-	-	-	-	-	1	3	3
CO3	3	2	1	2	2	-	-	-	-	-	-	1	3	3
CO4	3	2	3	2	3	1	-	-	-	-	-	1	2	2
CO5	3	2	3	2	2	2	-	-	-	-	-	1	2	3
Avg	3	2.2	2	1.6	2	1.3	-	-	-	-	-	1	2.4	2.4

Course Code & Name : 16GE1001/ Problem Solving and Python Programming Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3	-	2	-	-	-	2	-	-	2	2	2

Course Code & Name : 16ME1002 Engineering Practices Laboratory

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	-	-	-	2	-	-	-	-	1	2	3	1
CO2	2	1	-	1	-	3	-	-	-	-	2	2	3	1
CO3	3	1	-	1	-	3	-	1	-	2	2	2	3	1
CO4	2	1	-	1	-	2	-	1	-	2	2	2	3	1
CO5	3	-	-	-	-	2	-	1	-	1	2	3	3	1
Avg	2.6	0.8	0	0.6	0	2.4	0	0.6	0	1	1.8	2.2	3	1

Semester – II

Course Code & Name : 16MA2102/ Engineering Mathematics II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	2
Avg	3	3	3	2.4	2.4	-	-	-	-	-	-	2	2	2

Course Code & Name : 16PH2102/ Physics of Materials

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	2	1	1	1	1	-	-	-	-	-	1	2	1
CO2	3	3	1	1	2	-	-	-	-	-	-	1	2	2
CO3	3	2	1	2	2	-	-	-	-	-	-	1	2	3
CO4	3	3	1	2	2	1	-	-	-	-	-	1	2	2
CO5	3	2	2	3	2	1	2	-	-	-	-	1	2	3
Avg	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1	2	2.2

Course Code & Name : 16CY2102/ Environmental Sciences

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2	-	-	-	-	2	3	3	2	-	-	2	-	-
CO2	2	-	-	-	-	2	3	3	2	-	-	2	-	-
CO3	2	1	1	-	-	2	3	3	2	-	-	2	-	-
CO4	2	1	2	-	-	2	3	3	2	-	-	2	-	-
CO5	2	1	2	-	-	2	3	3	2	-	-	2	-	-
Avg	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-

Course Code & Name : 16HE2101R/ Essential English For Engineers II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	1	2	1	1	1	2	1	2	2	3	-	3	1	-
CO2	2	1	1	1	1	2	2	2	2	3	-	2	-	1
CO3	2	2	1	1	1	2	2	2	2	3	1	3	1	-
CO4	2	2	1	1	2	2	2	2	3	3	1	3	1	1
CO5	1	1	1	1	1	2	2	1	2	3	1	3	1	1
Avg	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1

Course Code & Name : 16GE2101 Engineering Mechanics

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1				1				1	1	1	2
CO2	3	3	2	1			1				1	1	1	2
CO3	3	3	1			1	1			1	1		1	1
CO4	3	3	2	1		2	1			1	1	1	1	1
CO5	3	3	2	1		3	1			1	1	1	1	1
Avg	3	3	1.6	0.6	0	1.2	1	0	0	0.6	1	0.8	1	1.4

Course Code & Name : 16EE2202/Basics of Electrical and Electronics Engineering

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3											3	3
CO2		2											3	0
CO3		1	2	1		2							3	3
CO4									1		1		3	0
CO5			1	1	1								3	0
Avg	3	3											3	3

Course Code & Name : 16ME2001 Engineering Practices

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	-	-	-	2	-	-	-	-	1	2	3	1
CO2	2	1	-	1	-	3	-	-	-	-	2	2	3	1
CO3	3	1	-	1	-	3	-	1	-	2	2	2	3	1
CO4	2	1	-	1	-	2	-	1	-	2	2	2	3	1
CO5	3	-	-	-	-	2	-	1	-	1	2	3	3	1
Avg	2.6	0.8	0	0.6	0	2.4	0	0.6	0	1	1.8	2.2	3	1

Course Code & Name : 16PS2001/ Physical Science Lab II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	-	-	-	-	-	1	2	1
CO2	3	3	1	1	2	-	-	-	-	-	-	1	3	3
CO3	3	2	1	2	2	-	-	-	-	-	-	1	3	3
CO4	3	2	3	2	3	1	-	-	-	-	-	1	2	2
CO5	3	2	3	2	2	2	-	-	-	-	-	1	2	3
Avg	3	2.2	2	1.6	2	1.3	-	-	-	-	-	1	2.4	2.4

Code & Name : 16ME2001 Computer Aided Drafting Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	1	1	-	-	-	-	3	3	3	3	2
CO2	1	2	2	1	2	-	-	-	-	2	2	3	2	2
CO3	1	2	2	1	2	-	-	-	-	2	2	3	2	1
Avg	1.3	2	2	1	1.6	0	0	0	0	2.3	2.3	3	1.3	1.6

Semester – III

Course Code & Name: 16MA3101/ Fourier Series and Statistics

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	2	3	1	2	-	-	-	-	-	-	2	3	1
CO2	3	3	3	2	1	-	-	-	-	-	-	3	2	3
CO3	3	3	3	1	1	-	-	-	-	-	-	2	2	2
CO4	3	3	3	1	2	2	-	-	-	-	-	2	2	2
CO5	3	3	3	2	1	1	-	-	-	-	-	2	2	3
Avg	3	2.8	3	1.4	1.4	2	-	-	-	-	-	2.2	2.2	2.2

Course Code & Name : 16ME3201 Manufacturing Technology-I

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	2	2	1	-	-	1	-	-	-	1	1	1
CO2	3	1	2	2	2	-	-	1	-	-	-	1	1	1
CO3	3	1	2	2	1	-	-	1	-	-	-	1	1	1
CO4	3	1	2	2	1	-	-	1	-	-	-	1	1	1
CO5	3	1	2	2	1	-	-	1	-	-	-	1	1	1
Avg	3	1	2	2	1.2	0	0	1	0	0	0	1	1	1

Course Code & Name : 16ME3202 Engineering Thermodynamics

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1	1										1	1
CO2	1	2	2	2									2	
CO3	2	2	3	2										
CO4	3	1	1	2										
CO5	2	2	3	2	1					1			2	1
Avg	1.8	1.6	2	1.6	0.2	0	0	0	0	0.2	0	0	1	0.4

Course Code & Name : 16ME3203 Fluid Mechanics and Machinery

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	2	1	1	1	1	1	1	1	1	1	2	1
CO2	1	1	3	1	1	1	1	1	1	1	1	1	3	1
CO3	1	1	2	2	1	1	1	1	1	1	1	1	2	1
CO4	2	1	1	1	2	1	1	1	1	1	1	1	2	1
CO5	1	1	1	1	1	3	2	1	1	3	1	1	1	2
Avg	1.4	1	1.8	1.2	1.2	1.4	1.2	1	1	1.4	1	1	2	1.2

Course Code & Name : 16ME3204 Strength of materials

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	2	2	-	-	1	-	3	1	2
CO2	3	-	-	-	-	2	2	-	-	1	-	3	1	1
CO3	3	-	-	-	-	2	2	-	-	1	-	3	1	1
CO4	3	-	-	-	3	3	3	-	-	1	-	3	2	2
CO5	3	-	-	-	-	2	2	-	-	1	-	3	1	1
Avg	3	0	0	0	0.6	2.2	2.2	0	0	1	0	3	1.2	1.4

Course Code & Name : 16ME3231 Electrical Drives and Control

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	2	1	1	1	1	1	1	1	1	1	2	1
CO2	1	1	3	1	1	1	1	1	1	1	1	1	3	1
CO3	1	1	2	2	1	1	1	1	1	1	1	1	2	1
CO4	2	1	1	1	2	1	1	1	1	1	1	1	2	1
CO5	1	1	1	1	1	3	2	1	1	3	1	1	1	2
Avg	1.4	1	1.8	1.2	1.2	1.4	1.2	1	1	1.4	1	1	2	1.2

Course Code & Name : 16ME3001 Manufacturing Technology Lab – I

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	-	1	-	2	-	-	-	2	1
Avg	3	3	3	3	3	-	1	-	2	-	-	-	2	1

Course Code & Name : 16ME3002 Solid and Fluid Mechanics Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	-	1	-	2	-	-	-	2	1
CO2	3	3	3	3	3		1		2				2	1
CO3	3	3	3	3	3		1		2				2	1
CO4	3	3	3	3	3		1		2				2	1
CO5	3	1	2	2	1								1	1
Avg	3	2.6	2.8	2.8	2.6	0	0	0	0	0	0	0	1.8	1

Course Code & Name : 16ME3031 Electrical Engineering Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	-	-	-	2	-	-	-	-	1	2	3	1
CO2	2	1	-	1	-	3	-	-	-	-	2	2	3	1
CO3	3	1	-	1	-	3	-	1	-	2	2	2	3	1
CO4	2	1	-	1	-	2	-	1	-	2	2	2	3	1
CO5	3	-	-	-	-	2	-	1	-	1	2	3	3	1
Avg	2.6	0.8	0	0.6	0	2.4	0	0.6	0	1	1.8	2.2	3	1

Semester – IV

Course Code & Name: 16MA4107/NUMERICALL METHODS

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	3	3	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO3	3	3	3	3	2	-	-	-	-	-	-	2	2	1
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	1
Avg	3	3	3	3	2.6	-	-	-	-	-	-	2	2	1.2

Course Code & Name : 16ME4201 Manufacturing Technology – II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	2	2	1								1	1
CO2	3	1	2	2	2								1	1
CO3	3	1	2	2	1								1	1
CO4	3	1	2	2	1								1	1
CO5	3	1	2	2	1								1	1
Avg	3	1	2	2	1.2	0	0	0	0	0	0	0	1	1

Course Code & Name : 16ME4202 Thermal Engineering

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1	-	1	-	-		-	-	1	1	1
CO2	3	1	1	1	-	2	2	-	1	-	1	1	1	1
CO3	3	1	1	1	-	-	-	-		-	-	1	1	1
CO4	3	1	1	1	-	-	-	-		-	-	1	1	1
CO5	3	1	1	1	-	2	1	-	1	-	1	1	1	1
Avg	3	1	1	1	-	1	0.6	-	0.4	-	0.4	1	1	1

Course Code & Name : 16ME4203 Kinematics of Machinery

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	3				2		2			2	1
CO2	3	1	2	1				1		1			2	
CO3	3	1	1	1				1		1			2	1
CO4	2	1	1										1	
CO5	3	2	1										2	
Avg	3	3	1	3				2		2			2	1

Course Code & Name : 16ME4204 Engineering Materials and Metallurgy

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	2	2	-	-	1	-	3	1	2
CO2	3	-	-	-	-	2	2	-	-	1	-	3	1	1
CO3	3	-	-	-	-	2	2	-	-	1	-	3	1	1
CO4	3	-	-	-	3	3	3	-	-	1	-	3	2	2
CO5	3	-	-	-	-	2	2	-	-	1	-	3	1	1
Avg	3	0	0	0	0.6	2.2	2.2	0	0	1	0	3	1.2	1.4

Course Code & Name : 16ME4205 Machine Drawing

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	-	1	-	-	-	-	-	2	-	1
CO2	2	2	1	1	-	-	-	-	-	-	-	1	-	1
CO3	2	3	3	1	1	-	-	-	-	-	-	1	-	1
CO4	3	2	2	2	1	-	-	-	-	-	-	2	1	1
CO5	3	2	2	2	1	-	-	-	-	-	-	2	1	1
Avg	3	2	2	1	-	1	-	-	-	-	-	2	-	1

Course Code & Name : 16ME4001 Manufacturing Technology Lab-II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	-	1	-	2	-	-	-	2	1
CO2	3	3	3	3	3		1		2				2	1
CO3	3	3	3	3	3		1		2				2	1
CO4	3	3	3	3	3		1		2				2	1
CO5	3	1	2	2	1								1	1
Avg	3	2.6	2.8	2.8	2.6	0	0	0	0	0	0	0	1.8	1

Course Code & Name : 16ME4002 Thermal Engineering Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1	1	1	-	1	1	-	2	1	-	1	-	-
CO2	2	2	2	2	-	1	2	-	2	2	1	2	2	1
CO3	1	1	1	1	-	1	1	-	2	1	1	1	1	1
CO4	2	2	1	1	-	1		-	2	1	1	1	2	-
CO5	2	2	2	1	-	2	2	-	2	2	1	2	2	2
Avg	1.6	1.6	1.4	1.2	-	1.2	1.2	-	2	1.4	0.8	1.4	1.4	0.8

Course Code & Name : 16ME4701 Communication skills lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	2	-	-	-	-	-	-	2	2	3	3
CO2	3	3	1	2	-	-	-	-	-	-	2	2	3	3
CO3	3	3	1	2	-	-	-	-	-	-	2	2	3	3
CO4	3	3	1	2	-	-	-	-	-	-	2	2	3	3
CO5	3	3	1	2	-	-	-	-	-	-	2	2	3	3
Avg	3	3	1	2	0	0	0	0	0	0	2	2	3	3



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